FCC 47 CFR § 2.1093
IEEE Std 1528-2013

SAR EVALUATION REPORT

FOR

WCDMA/LTE Tablet + BT/BLE, DTS/UNII a/b/g/n

MODEL NUMBER: SM-T378V

FCC ID: A3LSMT378V

REPORT NUMBER: 4788103295-S1V3

ISSUE DATE: 9/25/2017

Prepared for
SAMSUNG ELECTRONICS CO., LTD.
129 SAMSUNG-RO, YEONGTONG-GU, SUWON-SI,
GYEONGGI-DO, 16677, KOREA

Prepared by
UL Korea, Ltd. Suwon Laboratory
218 Maeyeong-ro, Yeongtong-gu,
Suwon-si, Gyeonggi-do, 16675, Korea
TEL: (031) 337-9902
FAX: (031) 213-5433

ACCREDITED

TL-637

Revision History

Rev.	Date	Revisions	Revised By
V1	9/19/2017	Initial Issue	SeongGon Lee
V2	9/21/2017	Sec.6.6.1. -Revised typo in picture. Sec.9.2.1. -Added Note 2. Sec.10.4. -Revised typo in table of LTE Band 4. Sec.12. -Revised Edge 1 distance in WCDMA Band II Ant.	SeongGon Lee
V3	9/25/2017	Sec.12.4 -Revised SPLSR value up to two digits.	SeongGon Lee

This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

Table of Contents

1. Attestation of Test Results 5

2. Test Specification, Methods and Procedures 6

3. Facilities and Accreditation 6

4. SAR Measurement System & Test Equipment 7

4.1. SAR Measurement System 7

4.2. SAR Scan Procedures 8

4.3. Test Equipment 10

5. Measurement Uncertainty 10

6. Device Under Test (DUT) Information 11

6.1. DUT Description 11

6.2. Wireless Technologies 11

6.3. Nominal and Maximum Output Power from Tune-up Procedure 12

6.4. General LTE SAR Test and Reporting Considerations 13

6.5. LTE Carrier Aggregation 14

6.6. Power Reduction by Proximity Sensing 15

6.6.1. Proximity Sensor Triggering Distance (KDB 616217 §6.2) 15

6.6.2. Proximity Sensor Coverage (KDB 616217 §6.3) 21

6.6.3. Proximity Sensor Tilt Angle Assessment (KDB 616217 §6.4) 21

6.6.4. Resulting test positions for SAR measurements 22

7. RF Exposure Conditions (Test Configurations) 23

7.1. Standalone SAR Test Exclusion Considerations 23

7.2. Required Test Configurations 26

8. Dielectric Property Measurements & System Check 27

8.1. Dielectric Property Measurements 27

8.2. System Check 32

9. Conducted Output Power Measurements 35

9.1. W-CDMA 35

9.2. LTE 39

9.2.1 LTE Rel. 10 Carrier Aggregation 49

9.3. Wi-Fi 2.4 GHz (DTS Band) 50

9.4. Wi-Fi 5 GHz (U-NII Bands) 50

9.5. Bluetooth 51

10. Measured and Reported (Scaled) SAR Results 51

This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

10.1. W-CDMA Band II ... 53
10.2. W-CDMA Band V ... 53
10.3. LTE Band 2 (20 MHz Bandwidth) ... 53
10.4. LTE Band 4 (20 MHz Bandwidth) ... 54
10.5. LTE Band 5 (10MHz Bandwidth) ... 54
10.6. LTE Band 7 (20MHz Bandwidth) ... 55
10.7. LTE Band 13 (10MHz Bandwidth) ... 55
10.8. Wi-Fi (DTS Band) ... 56
10.9. Wi-Fi (U-NII Band) ... 56
10.10. Bluetooth ... 56

11. SAR Measurement Variability ... 57

12. Simultaneous Transmission SAR Analysis ... 58
12.1. Sum of the SAR for WCDMA Band II & Wi-Fi & BT ... 60
12.2. Sum of the SAR for WCDMA Band V & Wi-Fi & BT ... 60
12.3. Sum of the SAR for LTE Band 2 & Wi-Fi & BT ... 60
12.4. Sum of the SAR for LTE Band 4 & Wi-Fi & BT ... 61
12.5. Sum of the SAR for LTE Band 5 & Wi-Fi & BT ... 61
12.6. Sum of the SAR for LTE Band 7 & Wi-Fi & BT ... 61
12.7. Sum of the SAR for LTE Band 13 & Wi-Fi & BT ... 62

Appendixes ... 63
4788103295-S1V3 FCC Report SAR_App A_Photos & Ant. Locations ... 63
4788103295-S1V3 FCC Report SAR_App B_Highest SAR Test Plots ... 63
4788103295-S1V3 FCC Report SAR_App C_System Check Plots ... 63
4788103295-S1V3 FCC Report SAR_App D_SAR Tissue Ingredients ... 63
4788103295-S1V3 FCC Report SAR_App E_Probe Cal. Certificates ... 63
4788103295-S1V3 FCC Report SAR_App F_Dipole Cal. Certificates ... 63

This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

1. Attestation of Test Results

Applicant Name	SAMSUNG ELECTRONICS CO.,LTD.			
FCC ID	A3LSMT378V			
Model Number	SM-T378V			
Applicable Standards	FCC 47 CFR § 2.1093 Published RF exposure KDB procedures IEEE Std 1528-2013			
Exposure Category	SAR Limits (W/Kg)			
	Peak spatial-average(1g of tissue)			
General population / Uncontrolled exposure	1.6			
RF Exposure Conditions	Equipment Class - Highest Reported SAR (W/kg)			
	Licensed	DTS	U-NII	DSS (BT)
Standalone	0.72	0.93	0.88	N/A
Simultaneous TX	1.59	1.55	1.59	N/A
Date Tested	8/11/2017 to 9/6/2017, 9/8/2017 to 9/14/2017			
Test Results	Pass			

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.

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.

Approved & Released By:	Prepared By:
Justin Park Senior Engineer UL Korea, Ltd. Suwon Laboratory	SeongGon Lee Laboratory Technician UL Korea, Ltd. Suwon Laboratory

This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

2. Test Specification, Methods and Procedures

The tests documented in this report were performed in accordance with FCC 47 CFR § 2.1093, IEEE STD 1528-2013, the following FCC Published RF exposure KDB procedures:

- 248227 D01 802.11 Wi-Fi SAR v02r02
- 447498 D01 General RF Exposure Guidance v06
- 616217 D04 SAR for laptop and tablets v01r02
- 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

Additional Guidance: KDB inquiry

- Additional SAR test of corner side – KDB guidance to identify that SAR test when sensor and antenna is located near corner side.

3. Facilities and Accreditation

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

Suwon
SAR 1 Room
SAR 2 Room
SAR 3 Room

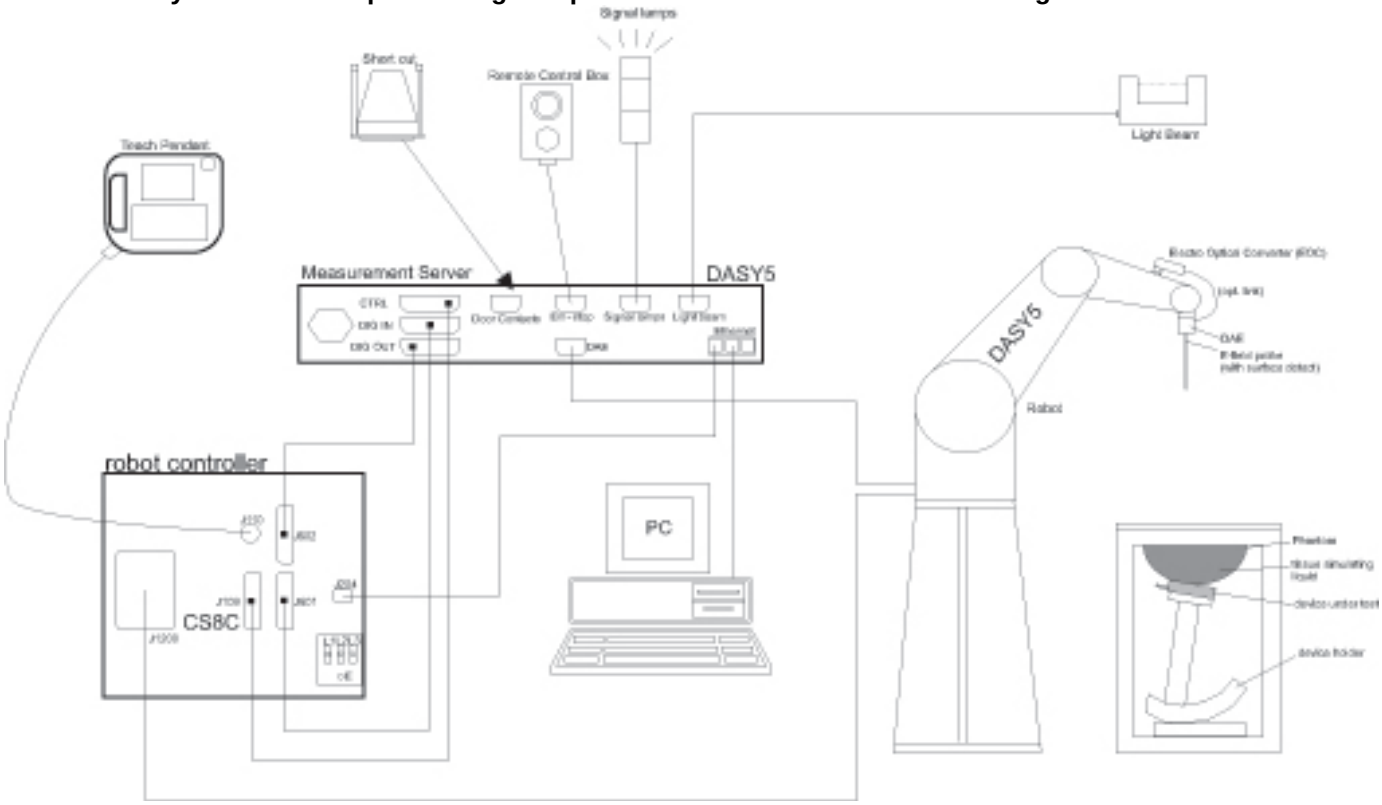
UL Korea, Ltd. is accredited by IAS, Laboratory Code TL-637.
The full scope of accreditation can be viewed at http://www.iasonline.org/PDF/TL/TL-637.pdf.

This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

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.

This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

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

This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

Step 3: Zoom Scan

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

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

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

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

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

Step 4: Power drift measurement

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

Step 5: Z-Scan (FCC only)

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

This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

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	8-8-2018
Dielectric Assessment Kit	SPEAG	DAK-3.5	1196	8-2-2018
Shorting block	SPEAG	DAK-3.5 Short	SM DAK 200 BA	N/A
Thermometer	LKM	DTM3000	3424	8-11-2018
Thermometer	Lutron	MHB-382SD	AH.91478	8-10-2018

System Check

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
MXG Analog Signal Generator	Agilent	N5181A	MY50145882	8-7-2018
Power Sensor	Agilent	U2000A	MY54260010	8-8-2018
Power Sensor	Agilent	U2000A	MY54260007	8-8-2018
Power Amplifier	EXODUS	1410025-AMP2027-10003	10003	8-8-2018
Directional Coupler	Agilent	772D	MY52180193	8-7-2018
Directional Coupler	Agilent	778D	MY52180432	8-7-2018
Low Pass Filter	MICROLAB	LA-15N	03943	8-7-2018
Low Pass Filter	FILTRON	L14012FL	1410003S	8-7-2018
Low Pass Filter	MICROLAB	LA-60N	03942	8-7-2018
Attenuator	Agilent	8491B/003	MY39269292	8-7-2018
Attenuator	Agilent	8491B/010	MY39269315	8-7-2018
Attenuator	Agilent	8491B/020	MY39269298	8-7-2018
E-Field Probe (SAR1)	SPEAG	EX3DV4	7314	9-27-2017
E-Field Probe (SAR2)	SPEAG	EX3DV4	7313	1-30-2018
E-Field Probe (SAR3)	SPEAG	EX3DV4	7330	2-28-2018
Data Acquisition Electronics (SAR1)	SPEAG	DAE4	1447	9-19-2017
Data Acquisition Electronics (SAR2)	SPEAG	DAE4	1494	7-20-2018
Data Acquisition Electronics (SAR3)	SPEAG	DAE4	912	11-18-2017
System Validation Dipole	SPEAG	D750V3	1122	8-30-2017
System Validation Dipole	SPEAG	D835V2	4d174	9-28-2017
System Validation Dipole	SPEAG	D835V2	4d194	7-19-2018
System Validation Dipole	SPEAG	D1750V2	1125	8-26-2017
System Validation Dipole	SPEAG	D1900V2	5d190	9-28-2017
System Validation Dipole	SPEAG	D1900V2	5d199	2-21-2018
System Validation Dipole	SPEAG	D2450V2	939	9-23-2017
System Validation Dipole	SPEAG	D2600V2	1097	11-15-2017
System Validation Dipole	SPEAG	D5GHzV2	1209	2-24-2018
Thermometer (SAR1)	Lutron	MHB-382SD	AH.91463	8-10-2018
Thermometer (SAR2)	Lutron	MHB-382SD	AH.50215	8-16-2018
Thermometer (SAR3)	Lutron	MHB-382SD	AH.50213	8-16-2018

Other

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Base Station Simulator	R & S	CMW500	150313	8-7-2018
Base Station Simulator	R & S	CMW500	150314	8-7-2018

Note(s):

Refer to Appendix F that mentioned about justification for Extended SAR Dipole Calibrations(D750V2, SN : 1122 and D1750V2, SN : 1125).

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.

This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

6. Device Under Test (DUT) Information

6.1. DUT Description

Device Dimension	Overall (Length x Width): 126.1 mm x 212.1 mm Overall Diagonal: 237.0 mm Display Diagonal: 203.1 mm
Back Cover	☒ The rechargeable battery is not user accessible.
Battery Options	☒ The rechargeable battery is not user accessible.
Wireless Router (Hotspot)	Wi-Fi Hotspot mode permits the device to share its cellular data connection with other Wi-Fi-enabled devices. ☒ Mobile Hotspot (Wi-Fi 2.4 GHz, Ch.1 ~ Ch.11) ☒ Mobile Hotspot(Wi-Fi 5 GHz, Ch.149)
Wi-Fi Direct	Wi-Fi Direct enabled devices transfer data directly between each other ☒ Wi-Fi Direct (Wi-Fi 2.4 GHz, Ch.1 ~ Ch.11) ☒ Wi-Fi Direct (Wi-Fi 5 GHz, Ch.36 ~ Ch.48, Ch.149 ~ Ch.165)
Test sample information	**No.** / **S/N** / **Notes** 1 / R32J7008DHH / Main conduction(1) 2 / R32J7008GGF / Main conduction(2) 3 / R32J7008CBB / Wi-Fi conduction 4 / R32J7008GAP / SAR 5 / R32J7008EZY / SAR 6 / R32J7008EVD / SAR

6.2. Wireless Technologies

Wireless technologies	Frequency bands	Operating mode	Duty Cycle used for SAR testing
W-CDMA (UMTS)	Band II Band V	UMTS Rel. 99 (Voice & Data) HSDPA (Release.14) HSUPA (Release.6)	100%
LTE	FDD Band 2 FDD Band 4 FDD Band 5 FDD Band 7 FDD Band 13	QPSK 16QAM ☒ Rel. 10 Carrier Aggregation (1 Uplink and 2 Downlinks) (Carrier Aggregation is only supported for downlink and not for uplink.)	100 % (FDD)
	Does this device support SV-LTE (1xRTT-LTE)? ☐ Yes ☒ No		
Wi-Fi	2.4 GHz	802.11b 802.11g 802.11n (HT20)	100%
	5 GHz	802.11a 802.11n (HT20,HT40)	100%
	Does this device support bands 5.60 ~ 5.65 GHz? ☒ Yes ☐ No		
	Does this device support Band gap channel? ☒ Yes ☐ No		
Bluetooth	2.4 GHz	Version 4.2 LE	76.96% (DH5)

This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

6.3. Nominal and Maximum Output Power from Tune-up Procedure

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

Upper limit (dB): -1.5 ~ 0.5		Max. RF Output Power (dBm)		Reduction RF Output Power (dBm)	
RF Air interface	Mode	Target	Max. tune-up tolerance limit	Target	Max. tune-up tolerance limit
W-CDMA Band V	R99	23.0	**23.5**	18.0	**18.5**
	HSDPA	23.0	**23.5**	18.0	**18.5**
	HSUPA	21.5	**22.0**	18.0	**18.5**
W-CDMA Band II	R99	23.0	**23.5**	11.5	**12.0**
	HSDPA	22.0	**22.5**	11.5	**12.0**
	HSUPA	22.0	**22.5**	11.5	**12.0**
LTE Band 2	QPSK, 16QAM	23.0	**23.5**	11.0	**11.5**
LTE Band 4	QPSK, 16QAM	23.5	**24.0**	11.5	**12.0**
LTE Band 5	QPSK, 16QAM	24.0	**24.5**	18.5	**19.0**
LTE Band 7	QPSK, 16QAM	22.5	**23.0**	14.5	**15.0**
LTE Band 13	QPSK, 16QAM	24.0	**24.5**	17.5	**18.0**

Upper limit (dB): ~ 0.5		Max. RF Output Power (dBm)		Reduction RF Output Power (dBm)	
RF Air interface	Mode	Target	Max. tune-up tolerance limit	Target	Max. tune-up tolerance limit
WiFi 2.4 GHz (Ch. 1~10)	802.11b	16.0	**16.5**	12.0	**12.5**
	802.11g	14.0	**14.5**	12.0	**12.5**
	802.11n HT20	12.0	**12.5**	12.0	**12.5**
WiFi 2.4 GHz (Ch. 11)	802.11b	16.0	**16.5**	12.0	**12.5**
	802.11g	12.0	**12.5**	12.0	**12.5**
	802.11n HT20	11.0	**11.5**	11.0	**11.5**
WiFi 5 GHz	802.11a	13.0	**13.5**	11.5	**12.0**
	802.11n HT20	11.5	**12.0**	11.5	**12.0**
	802.11n HT40	11.0	**11.5**	11.0	**11.5**
Bluetooth		7.5	**8.0**	N/A	
Bluetooth LE		6.0	**6.5**	N/A	

This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

6.4. General LTE SAR Test and Reporting Considerations

Item	Description						
Frequency range, Channel Bandwidth, Numbers and Frequencies	Band 2	Frequency range: 1850 - 1910 MHz					
		Channel Bandwidth					
		20 MHz	15 MHz	10 MHz	5 MHz	3 MHz	1.4 MHz
	Low	18700 /1860	18675/ 1857.5	18650/ 1855	18625/ 1852.5	18615/ 1851.5	18607/ 1850.7
	Mid	18900/ 1880	18900/ 1880	18900/ 1880	18900/ 1880	18900/ 1880	18900/ 1880
	High	19100/ 1900	19125/ 1902.5	19150/ 1905	19175/ 1907.5	19185/ 1908.5	19193/ 1909.3
	Band 4	Frequency range: 1710 - 1755 MHz					
		Channel Bandwidth					
		20 MHz	15 MHz	10 MHz	5 MHz	3 MHz	1.4 MHz
	Low	20050/ 1720	20025/ 1717.5	20000/ 1715	19975/ 1712.5	19965/ 1711.5	19957/ 1710.7
	Mid	20175/ 1732.5	20175/ 1732.5	20175/ 1732.5	20175/ 1732.5	20175/ 1732.5	20175/ 1732.5
	High	20300/ 1745	20325/ 1747.5	20350/ 1750	20375/ 1752.5	20385/ 1753.5	20393/ 1754.3
	Band 5	Frequency range: 824 - 849 MHz					
		Channel Bandwidth					
		20 MHz	15 MHz	10 MHz	5 MHz	3 MHz	1.4 MHz
	Low			20450/ 829	20425/ 826.5	20415/ 825.5	20407/ 824.7
	Mid			20525/ 836.5	20525/ 836.5	20525/ 836.5	20525/ 836.5
	High			20600/ 844	20625/ 846.5	20635/ 847.5	20643/ 848.3
	Band 7	Frequency range: 2500 - 2570 MHz					
		Channel Bandwidth					
		20 MHz	15 MHz	10 MHz	5 MHz	3 MHz	1.4 MHz
	Low	20850/ 2510	20825/ 2507.5	20800/ 2505	20775/ 2502.5		
	Mid	21100/ 2535	21100/ 2535	21100/ 2535	21100/ 2535		
	High	21350/ 2560	21375/ 2562.5	21400/ 2565	21425/ 2567.5		
	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		

This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

General LTE SAR Test and Reporting Considerations (Continued)

<table>
<tr><th>Item</th><th>Description</th></tr>
<tr><td>LTE transmitter and antenna implementation</td><td>Refer to Appendix A.</td></tr>
<tr><td>Maximum power reduction (MPR)</td><td>

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

<table>
<tr><th rowspan="2">Modulation</th><th colspan="6">Channel bandwidth / Transmission bandwidth (RB)</th><th rowspan="2">MPR (dB)</th></tr>
<tr><th>1.4 MHz</th><th>3.0 MHz</th><th>5 MHz</th><th>10 MHz</th><th>15 MHz</th><th>20 MHz</th></tr>
<tr><td>QPSK</td><td>> 5</td><td>> 4</td><td>> 8</td><td>> 12</td><td>> 16</td><td>> 18</td><td>≤ 1</td></tr>
<tr><td>16 QAM</td><td>≤ 5</td><td>≤ 4</td><td>≤ 8</td><td>≤ 12</td><td>≤ 16</td><td>≤ 18</td><td>≤ 1</td></tr>
<tr><td>16 QAM</td><td>> 5</td><td>> 4</td><td>> 8</td><td>> 12</td><td>> 16</td><td>> 18</td><td>≤ 2</td></tr>
</table>

MPR Built-in by design
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

</td></tr>
<tr><td>Power reduction</td><td>Yes</td></tr>
<tr><td>Spectrum plots for RB configurations</td><td>A properly configured base station simulator was used for the SAR and power measurements; therefore, spectrum plots for each RB allocation and offset configuration are not included in the SAR report.</td></tr>
</table>

6.5. LTE Carrier Aggregation

Combination	CA configuration	Bandwidth (MHz)											
		Carrier 1						Carrier 2					
		20	15	10	5	3	1.4	20	15	10	5	3	1.4
Inter-Band non-contiguous	2A - 13A(1)			√	√					√			
	13A - 2A(1)			√						√	√		
	4A - 13A(1)			√	√					√			
	13A - 4A(1)			√						√	√		

Note(s):

For supported channels, please refer to §6.4

This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

6.6. Power Reduction by Proximity Sensing

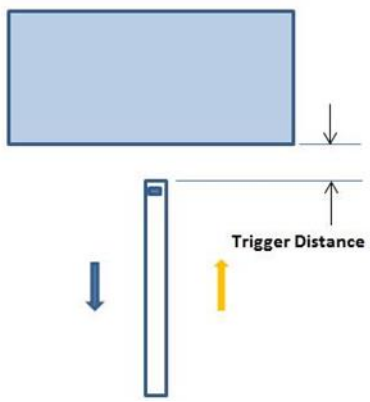
6.6.1. Proximity Sensor Triggering Distance (KDB 616217 §6.2)

Rear, Edge 1, Corner, Edge 4 of the DUT were placed directly below the flat phantom. The DUT was moved toward the phantom in accordance with the steps outlined in KDB 616217 §6.2 to determine the trigger distance for enabling power reduction. The DUT was moved away from the phantom to determine the trigger distance for resuming full power.

The measurement was then repeated for the surface of Rear, Edge 1, Corner, Edge 4.

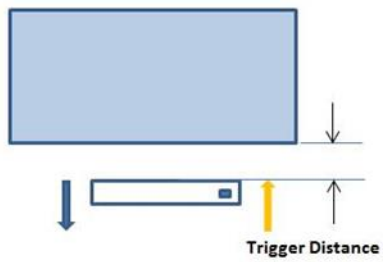
The DUT featured a visual indicator on its display that showed the status of the proximity sensor (Triggered or not triggered). This was used to determine the status of the sensor during the proximity sensor assessment as monitoring the output power directly was not practical without affecting the measurement.

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



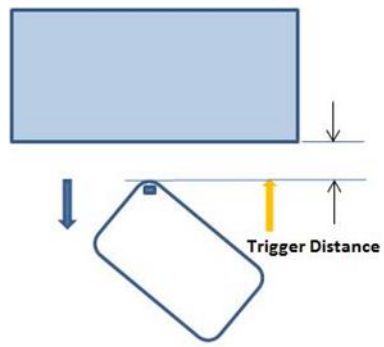
Proximity Sensor Trigger Distance Assessment

KDB 616217 §6.2, Edge 1, Edge 4



Proximity Sensor Trigger Distance Assessment

KDB 616217 §6.2, Rear



Proximity Sensor Trigger Distance Assessment

KDB 616217 §6.2, Corner of between Edge 1 and Edge 4

LEGEND

Direction of DUT travel for determination of power reduction triggering point

Direction of DUT travel for determination of full power resumption triggering point0

Summary of Trigger Distances

Tissue simulating liquid	Trigger distance - Rear		Trigger distance - Edge 1		Trigger distance - Corner		Trigger distance - Edge 4	
	Moving toward phantom	Moving from phantom	Moving toward phantom	Moving from phantom	Moving toward phantom	Moving from phantom	Moving toward phantom	Moving from phantom
750 muscle	22 mm	22 mm	15 mm	15 mm	10 mm	10 mm	10 mm	10 mm
850 muscle	22 mm	22 mm	15 mm	15 mm	10 mm	10 mm	10 mm	10 mm
1750 muscle	22 mm	22 mm	15 mm	15 mm	10 mm	10 mm	10 mm	10 mm
1900 muscle	22 mm	22 mm	15 mm	15 mm	10 mm	10 mm	10 mm	10 mm
2600 muscle	22 mm	22 mm	15 mm	15 mm	10 mm	10 mm	10 mm	10 mm
2450 muscle	7 mm	7 mm	N/A	N/A	N/A	N/A	N/A	N/A
5000 muscle	7 mm	7 mm	N/A	N/A	N/A	N/A	N/A	N/A

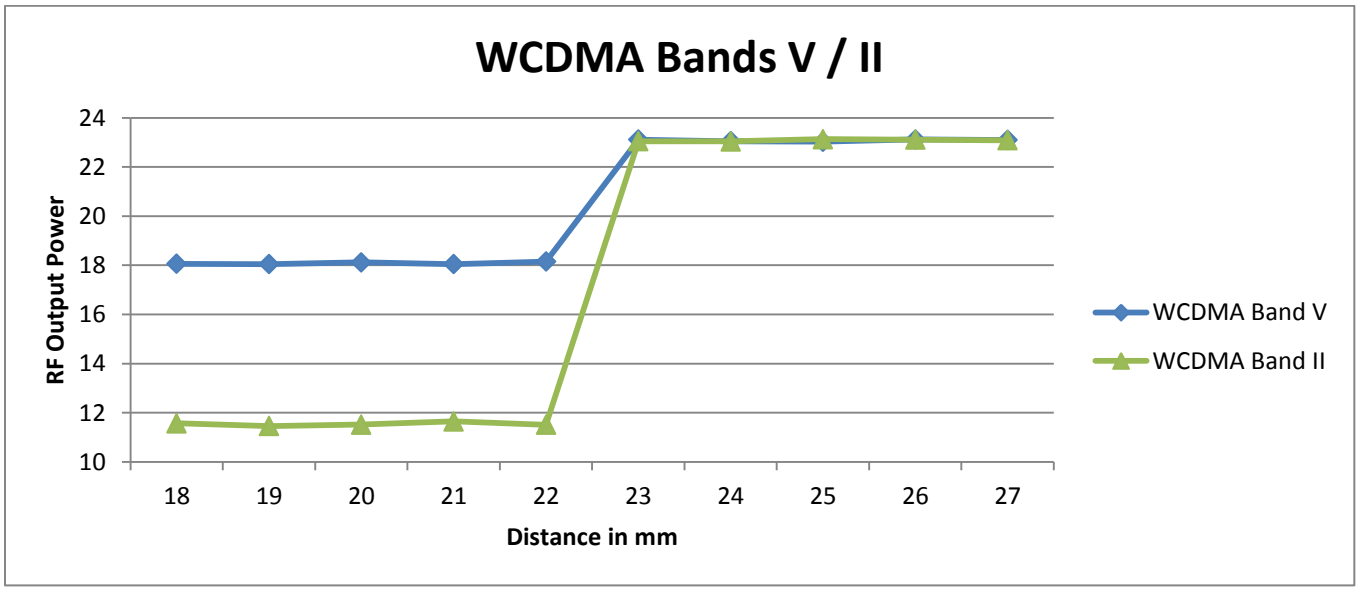
This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

Proximity Sensor Triggering Distance Measurement Results

WCDMA Bands II / V

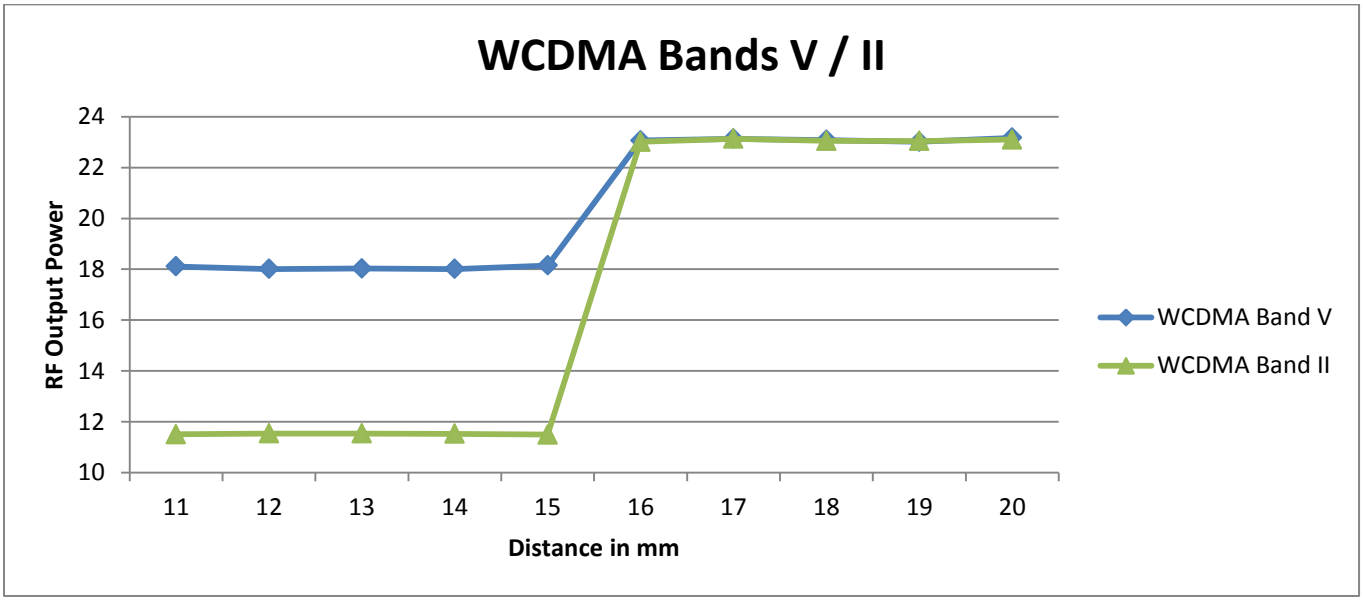
Rear, DUT Moving Toward (Trigger) and Away (Release) from the Phantom

Distance to DUT vs. Output Power in dBm										
Distance (mm)	18	19	20	21	22	23	24	25	26	27
WCDMA Band V	18.1	18.1	18.1	18.1	18.2	23.1	23.1	23.0	23.1	23.1
WCDMA Band II	11.6	11.5	11.5	11.7	11.5	23.1	23.0	23.1	23.1	23.1



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

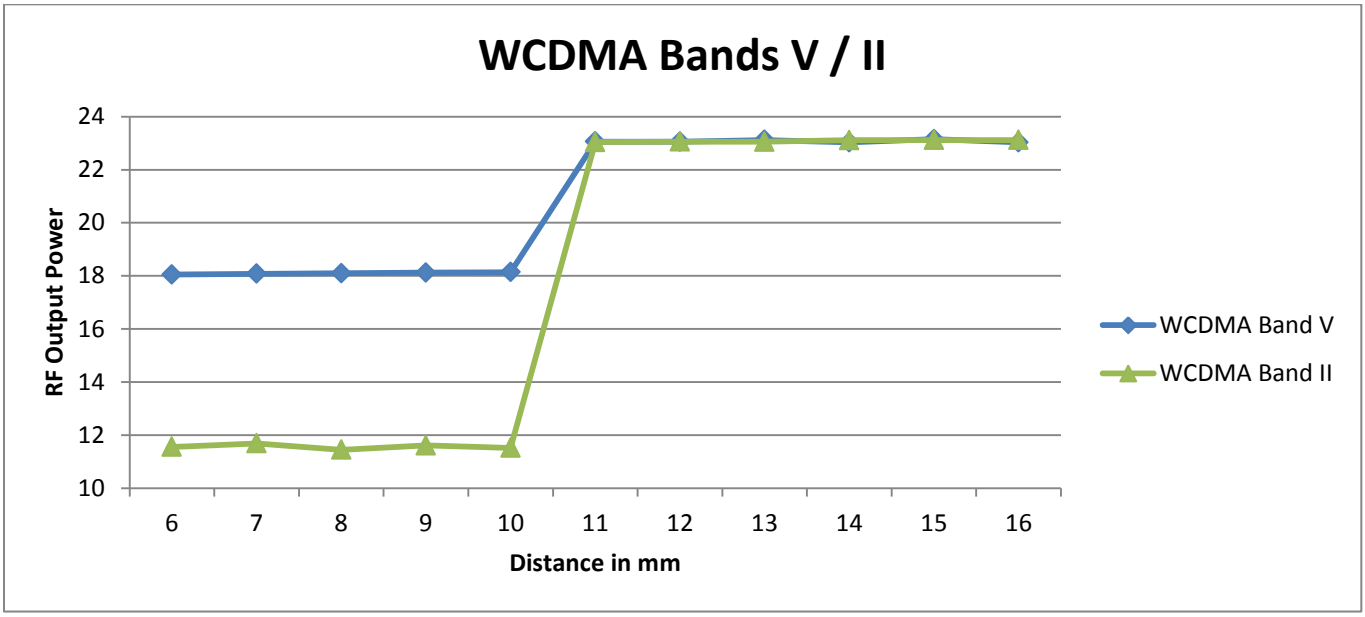
Distance to DUT vs. Output Power in dBm										
Distance (mm)	11	12	13	14	15	16	17	18	19	20
WCDMA Band V	18.1	18.0	18.0	18.0	18.2	23.1	23.1	23.1	23.0	23.2
WCDMA Band II	11.5	11.5	11.5	11.5	11.5	23.0	23.1	23.1	23.0	23.1



This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

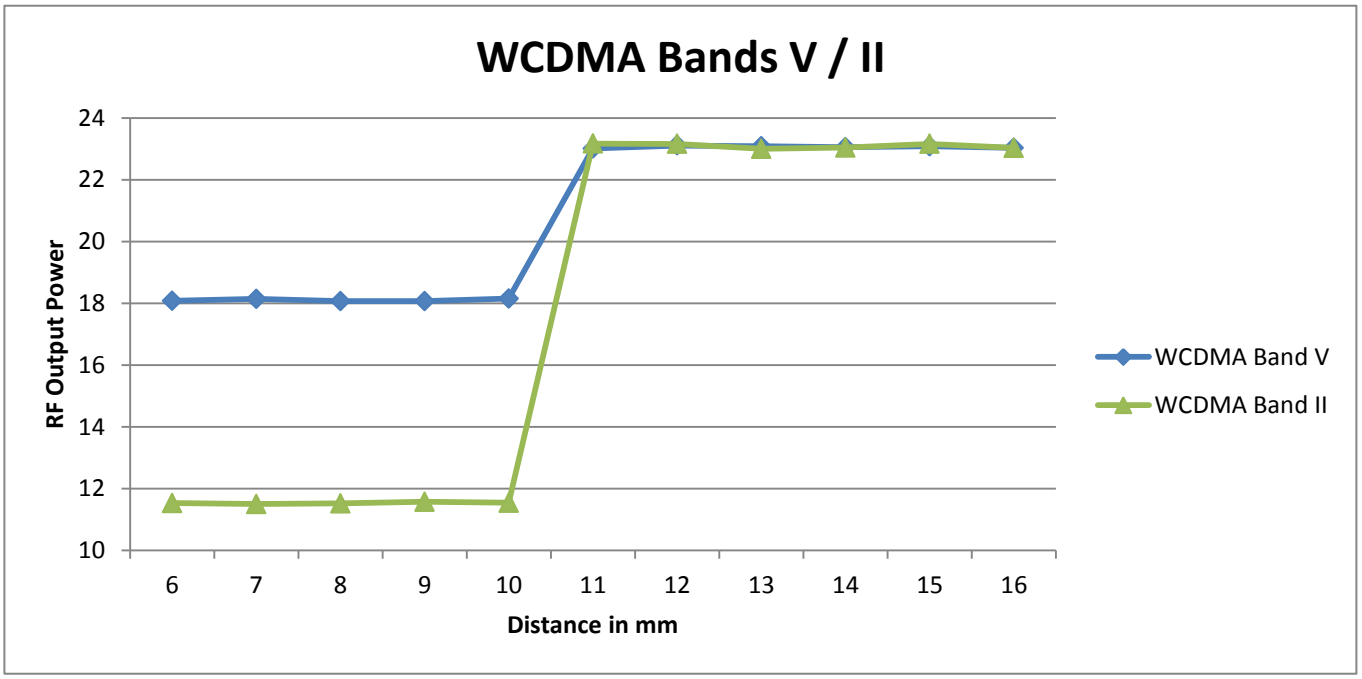
Edge 4, DUT Moving Toward (Trigger) and Away (Release) from the Phantom

Distance to DUT vs. Output Power in dBm											
Distance (mm)	6	7	8	9	10	11	12	13	14	15	16
WCDMA Band V	18.1	18.1	18.1	18.1	18.1	23.1	23.1	23.1	23.0	23.2	23.0
WCDMA Band II	11.6	11.7	11.5	11.6	11.5	23.0	23.1	23.1	23.1	23.1	23.1



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

Distance to DUT vs. Output Power in dBm											
Distance (mm)	6	7	8	9	10	11	12	13	14	15	16
WCDMA Band V	18.1	18.1	18.1	18.1	18.2	23.0	23.1	23.1	23.1	23.1	23.0
WCDMA Band II	11.5	11.5	11.5	11.6	11.5	23.2	23.2	23.0	23.0	23.2	23.0

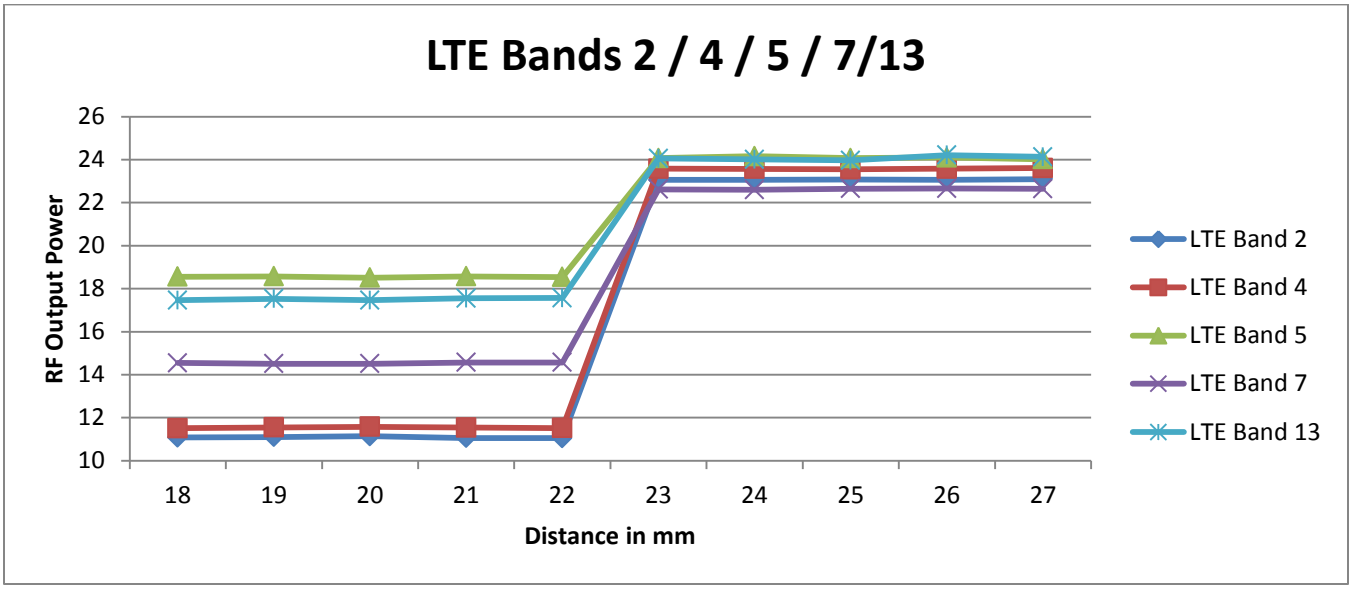


This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

LTE Bands 2 / 4/ 5 / 7/ 13

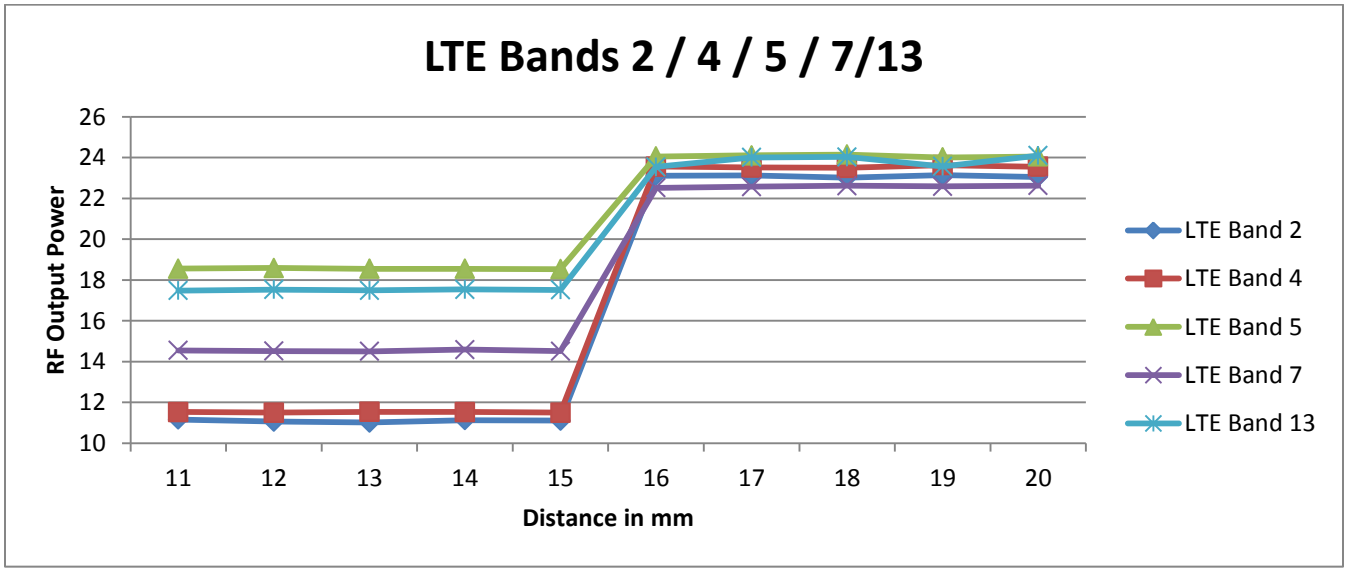
Rear, DUT Moving Toward (Trigger) and Away (Release) from the Phantom

Distance to DUT vs. Output Power in dBm										
Distance (mm)	18	19	20	21	22	23	24	25	26	27
LTE Band 2	11.1	11.1	11.1	11.1	11.1	23.1	23.1	23.1	23.1	23.1
LTE Band 4	11.5	11.6	11.6	11.5	11.5	23.6	23.6	23.6	23.6	23.6
LTE Band 5	18.6	18.6	18.5	18.6	18.5	24.1	24.2	24.1	24.1	24.0
LTE Band 7	14.6	14.5	14.5	14.6	14.6	22.6	22.6	22.7	22.7	22.6
LTE Band 13	17.5	17.5	17.5	17.6	17.6	24.1	24.0	24.0	24.2	24.1



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

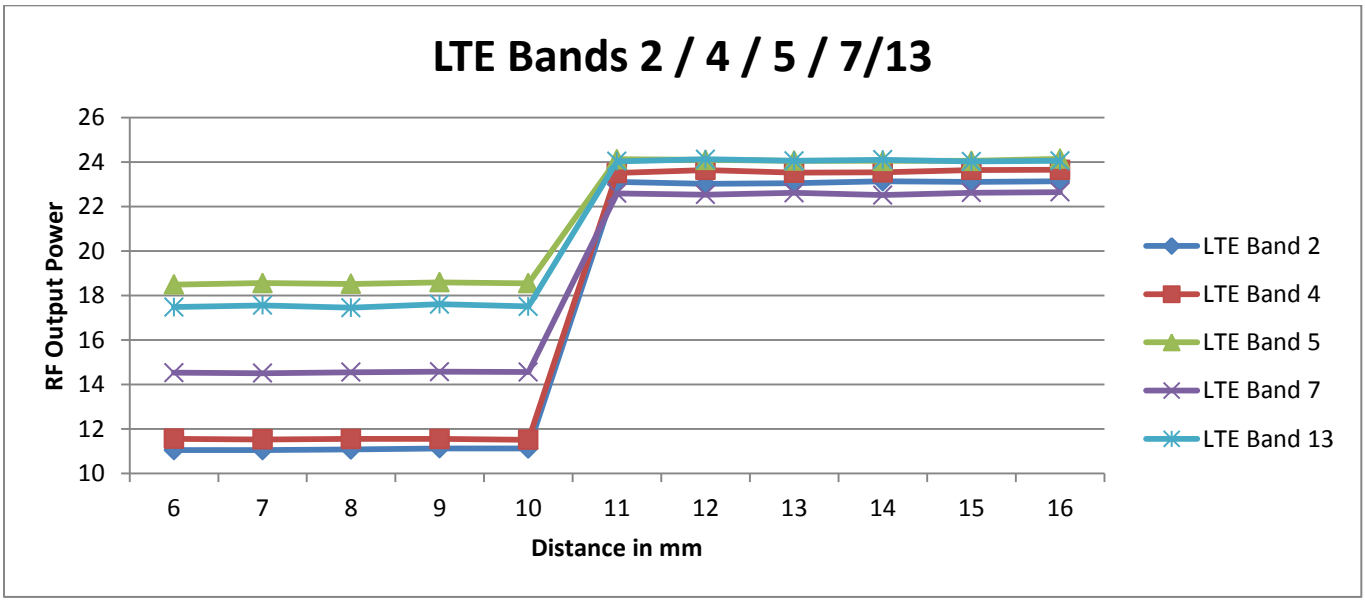
Distance to DUT vs. Output Power in dBm										
Distance (mm)	11	12	13	14	15	16	17	18	19	20
LTE Band 2	11.2	11.1	11.0	11.1	11.1	23.1	23.1	23.0	23.1	23.1
LTE Band 4	11.5	11.5	11.5	11.5	11.5	23.6	23.5	23.5	23.6	23.6
LTE Band 5	18.6	18.6	18.6	18.6	18.5	24.1	24.1	24.2	24.0	24.1
LTE Band 7	14.6	14.5	14.5	14.6	14.5	22.5	22.6	22.6	22.6	22.6
LTE Band 13	17.5	17.5	17.5	17.5	17.5	23.5	24.0	24.0	23.6	24.1



This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

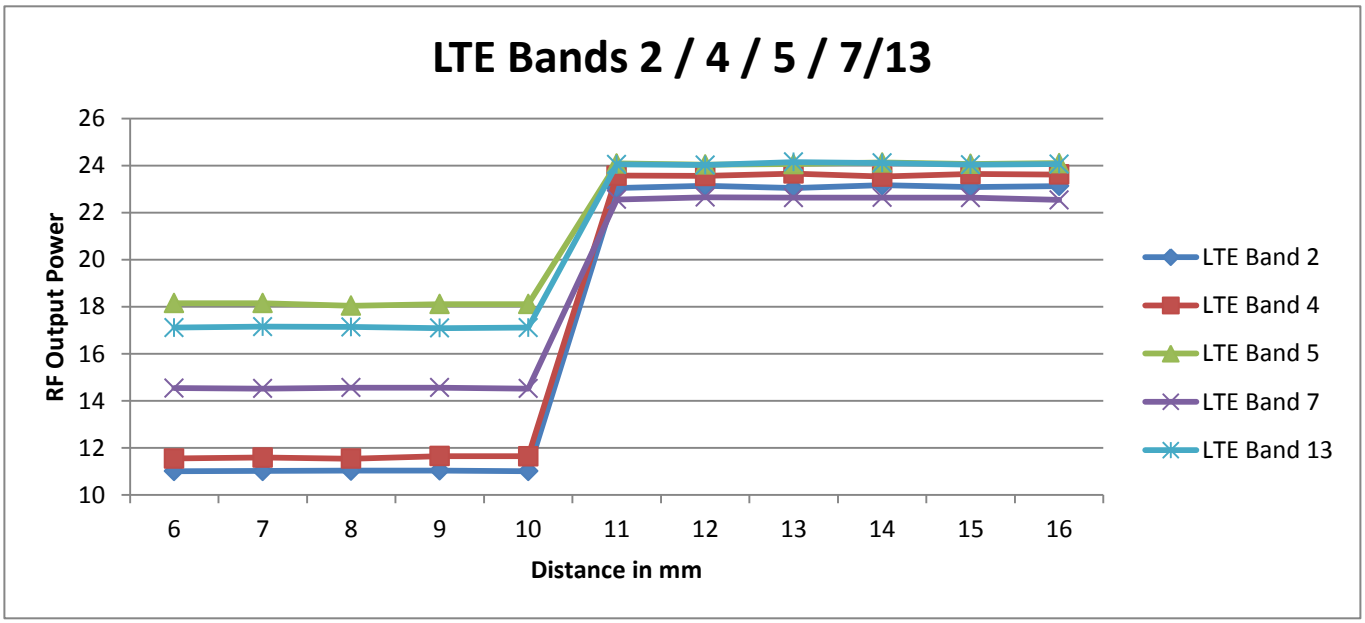
Edge 4, DUT Moving Toward (Trigger) and Away (Release) from the Phantom

Distance to DUT vs. Output Power in dBm											
Distance (mm)	6	7	8	9	10	11	12	13	14	15	16
LTE Band 2	11.1	11.1	11.1	11.1	11.1	23.1	23.0	23.1	23.1	23.1	23.1
LTE Band 4	11.6	11.5	11.6	11.6	11.5	23.5	23.6	23.5	23.5	23.6	23.7
LTE Band 5	18.5	18.6	18.5	18.6	18.6	24.1	24.1	24.1	24.1	24.1	24.1
LTE Band 7	14.5	14.5	14.6	14.6	14.6	22.6	22.5	22.6	22.5	22.6	22.7
LTE Band 13	17.5	17.6	17.5	17.6	17.5	24.0	24.1	24.1	24.1	24.0	24.1



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

Distance to DUT vs. Output Power in dBm											
Distance (mm)	6	7	8	9	10	11	12	13	14	15	16
LTE Band 2	11.0	11.0	11.0	11.0	11.0	23.0	23.1	23.0	23.2	23.1	23.1
LTE Band 4	11.6	11.6	11.5	11.7	11.6	23.6	23.6	23.7	23.5	23.6	23.6
LTE Band 5	18.2	18.2	18.0	18.1	18.1	24.1	24.0	24.1	24.1	24.1	24.1
LTE Band 7	14.5	14.5	14.6	14.6	14.5	22.6	22.7	22.6	22.6	22.6	22.5
LTE Band 13	17.1	17.2	17.1	17.1	17.1	24.1	24.0	24.2	24.1	24.0	24.1

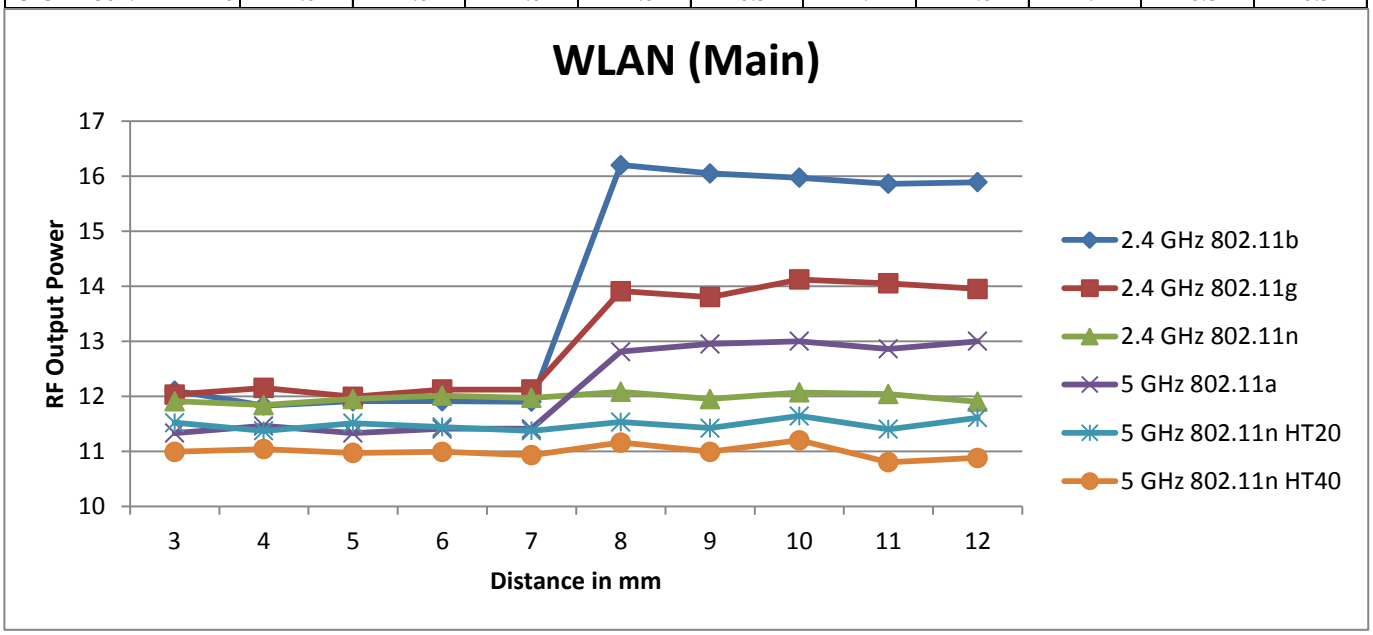


This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

Wi-Fi 2.4GHz and 5GHz

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

Distance to DUT vs. Output Power in dBm										
Distance	3	4	5	6	7	8	9	10	11	12
2.4 GHz 802.11b	12.1	11.8	11.9	11.9	11.9	16.2	16.1	16.0	15.9	15.9
2.4 GHz 802.11g	12.0	12.2	12.0	12.1	12.1	13.9	13.8	14.1	14.1	14.0
2.4 GHz 802.11n	11.9	11.8	12.0	12.0	12.0	12.1	12.0	12.1	12.0	11.9
5 GHz 802.11a	11.3	11.5	11.3	11.4	11.4	12.8	13.0	13.0	12.9	13.0
5 GHz 802.11n HT20	11.5	11.4	11.5	11.4	11.4	11.5	11.4	11.6	11.4	11.6
5 GHz 802.11n HT40	11.0	11.0	11.0	11.0	10.9	11.2	11.0	11.2	10.8	10.9



This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

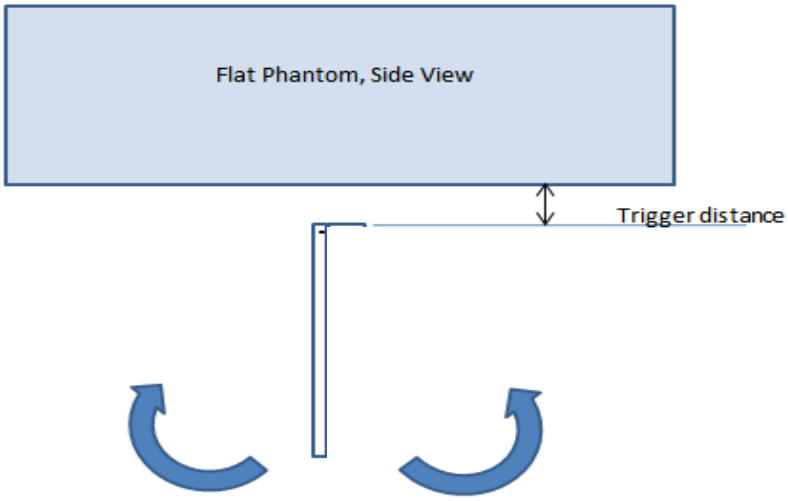
6.6.2. Proximity Sensor Coverage (KDB 616217 §6.3)

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

6.6.3. 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 1, Edge 4 parallel to the base of the flat phantom for each band.

The EUT was rotated about Edge 1, Edge 4 for angles up to +/- 45°. If the output power increased during the rotation the DUT was moved 1mm toward the phantom and the rotation repeated. This procedure was repeated until the power remained reduced for all angles up to +/- 45°.



Proximity sensor tilt angle assessment (Edge 1, Edge 4) KDB 616217 §6.4

Summary of Tablet Tilt Angle Influence to Proximity Sensor Triggering(Edge 1)

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°
750	15 mm	15 mm	On	On	On	On	On	On	On	On	On	On	On
850	15 mm	15 mm	On	On	On	On	On	On	On	On	On	On	On
1750	15 mm	15 mm	On	On	On	On	On	On	On	On	On	On	On
1900	15 mm	15 mm	On	On	On	On	On	On	On	On	On	On	On
2600	15 mm	15 mm	On	On	On	On	On	On	On	On	On	On	On

This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

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

Band (MHz)	Minimum trigger distance measured according to KDB 616217 §6.2	Minimum distance at which power reduction was maintained over +/-45°	Power reduction status										
			-45°	-40°	-30°	-20°	-10°	0°	10°	20°	30°	40°	45°
750	10 mm	10 mm	On	On	On	On	On	On	On	On	On	On	On
850	10 mm	10 mm	On	On	On	On	On	On	On	On	On	On	On
1750	10 mm	10 mm	On	On	On	On	On	On	On	On	On	On	On
1900	10 mm	10 mm	On	On	On	On	On	On	On	On	On	On	On
2600	10 mm	10 mm	On	On	On	On	On	On	On	On	On	On	On

6.6.4. Resulting test positions for SAR measurements

Wireless technologies	Position	§6.2 Triggering Distance	§6.3 Coverage	§6.4 Tilt Angle	Worst case distance for SAR
WWAN	Rear	22 mm	N/A	N/A	21 mm
	Edge 1	15 mm	N/A	15 mm	14 mm
	Corner	10 mm	N/A	N/A	9 mm
	Edge 4	10 mm	N/A	10 mm	9 mm
WLAN	Rear	7 mm	N/A	N/A	6 mm

Note(s):

Corner side is located between Edge 1 and Edge 4.

This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

7. RF Exposure Conditions (Test Configurations)

Refer to “SAR Photos and Ant locations” Appendix for the specific details of the antenna-to-antenna and antenna-to-edge(s) distances.

7.1. Standalone SAR Test Exclusion Considerations

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

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

SAR Test Exclusion Calculations for WWAN

Antennas < 50mm to adjacent edges

Antenna	Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)						Calculated Threshold Value					
			dBm	mW	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Corner	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Corner
Full Power, Proximity Sensor Off																
Cellular	W-CDMA 5	846.6	23.50	224	1.1	3	88.5	178.5	4	9.2	41.2 -MEASURE-	41.2 -MEASURE-	*> 50 mm*	*> 50 mm*	41.2 -MEASURE-	22.9 -MEASURE-
Cellular	W-CDMA 2	1907.6	23.50	224	1.1	3	88.5	178.5	4	9.2	61.9 -MEASURE-	61.9 -MEASURE-	*> 50 mm*	*> 50 mm*	61.9 -MEASURE-	34.4 -MEASURE-
Cellular	LTE Band 2	1900	23.50	224	1.1	3	88.5	178.5	4	9.2	61.8 -MEASURE-	61.8 -MEASURE-	*> 50 mm*	*> 50 mm*	61.8 -MEASURE-	34.3 -MEASURE-
Cellular	LTE Band 4	1754.3	24.00	251	1.1	3	88.5	178.5	4	9.2	66.5 -MEASURE-	66.5 -MEASURE-	*> 50 mm*	*> 50 mm*	66.5 -MEASURE-	36.9 -MEASURE-
Cellular	LTE Band 5	844	24.50	282	1.1	3	88.5	178.5	4	9.2	51.8 -MEASURE-	51.8 -MEASURE-	*> 50 mm*	*> 50 mm*	51.8 -MEASURE-	28.8 -MEASURE-
Cellular	LTE Band 7	2560	23.00	200	1.1	3	88.5	178.5	4	9.2	64 -MEASURE-	64 -MEASURE-	*> 50 mm*	*> 50 mm*	64 -MEASURE-	35.6 -MEASURE-
Cellular	LTE Band 13	782	24.50	282	1.1	3	88.5	178.5	4	9.2	49.9 -MEASURE-	49.9 -MEASURE-	*> 50 mm*	*> 50 mm*	49.9 -MEASURE-	27.7 -MEASURE-
Power Back-off, Proximity Sensor On																
Cellular	W-CDMA 5	846.6	18.50	71	1.1	3			4	9.2	13.1 -MEASURE-	13.1 -MEASURE-			13.1 -MEASURE-	7.3 -MEASURE-
Cellular	W-CDMA 2	1907.6	12.00	16	1.1	3			4	9.2	4.4 -MEASURE-	4.4 -MEASURE-			4.4 -MEASURE-	2 -EXEMPT-
Cellular	LTE Band 2	1900	11.50	14	1.1	3			4	9.2	3.9 -MEASURE-	3.9 -MEASURE-			3.9 -MEASURE-	2.1 -EXEMPT-
Cellular	LTE Band 4	1754.3	12.00	16	1.1	3			4	9.2	4.2 -MEASURE-	4.2 -MEASURE-			4.2 -MEASURE-	2.4 -EXEMPT-
Cellular	LTE Band 5	844	19.00	79	1.1	3			4	9.2	14.5 -MEASURE-	14.5 -MEASURE-			14.5 -MEASURE-	8.1 -MEASURE-
Cellular	LTE Band 7	2560	15.00	32	1.1	3			4	9.2	10.2 -MEASURE-	10.2 -MEASURE-			10.2 -MEASURE-	5.7 -MEASURE-
Cellular	LTE Band 13	782	18.00	63	1.1	3			4	9.2	11.1 -MEASURE-	11.1 -MEASURE-			11.1 -MEASURE-	6.2 -MEASURE-

Note(s):

1. According to KDB 447498, if the calculated threshold value is >3 then SAR testing is required.
2. Corner side is located between Edge 1 and Edge 4.

This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

Antennas > 50mm to adjacent edges

Antenna	Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)						Calculated Threshold Value					
			dBm	mW	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Corner	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Corner
Full Power, Proximity Sensor Off																
Cellular	W-CDMA 5	846.6	23.50	224	1.1	3	88.5	178.5	4	9.2	< 50 mm	< 50 mm	380.3 mW -EXEMPT-	888.3 mW -EXEMPT-	< 50 mm	< 50 mm
Cellular	W-CDMA 2	1907.6	23.50	224	1.1	3	88.5	178.5	4	9.2	< 50 mm	< 50 mm	493.6 mW -EXEMPT-	1393.6 mW -EXEMPT-	< 50 mm	< 50 mm
Cellular	LTE Band 2	1900	23.50	224	1.1	3	88.5	178.5	4	9.2	< 50 mm	< 50 mm	493.8 mW -EXEMPT-	1393.8 mW -EXEMPT-	< 50 mm	< 50 mm
Cellular	LTE Band 4	1754.3	24.00	251	1.1	3	88.5	178.5	4	9.2	< 50 mm	< 50 mm	498.3 mW -EXEMPT-	1398.3 mW -EXEMPT-	< 50 mm	< 50 mm
Cellular	LTE Band 5	844	24.50	282	1.1	3	88.5	178.5	4	9.2	< 50 mm	< 50 mm	379.9 mW -EXEMPT-	886.3 mW -EXEMPT-	< 50 mm	< 50 mm
Cellular	LTE Band 7	2560	23.00	200	1.1	3	88.5	178.5	4	9.2	< 50 mm	< 50 mm	478.8 mW -EXEMPT-	1378.8 mW -EXEMPT-	< 50 mm	< 50 mm
Cellular	LTE Band 13	782	24.50	282	1.1	3	88.5	178.5	4	9.2	< 50 mm	< 50 mm	370.3 mW -EXEMPT-	839.5 mW -EXEMPT-	< 50 mm	< 50 mm
Power Back-off, Proximity Sensor On																
Cellular	W-CDMA 5	846.6	18.50	71	1.1	3			4	9.2	< 50 mm	< 50 mm			< 50 mm	< 50 mm
Cellular	W-CDMA 2	1907.6	12.00	16	1.1	3			4	9.2	< 50 mm	< 50 mm			< 50 mm	< 50 mm
Cellular	LTE Band 2	1900	11.50	14	1.1	3			4	9.2	< 50 mm	< 50 mm			< 50 mm	< 50 mm
Cellular	LTE Band 4	1754.3	12.00	16	1.1	3			4	9.2	< 50 mm	< 50 mm			< 50 mm	< 50 mm
Cellular	LTE Band 5	844	19.00	79	1.1	3			4	9.2	< 50 mm	< 50 mm			< 50 mm	< 50 mm
Cellular	LTE Band 7	2560	15.00	32	1.1	3			4	9.2	< 50 mm	< 50 mm			< 50 mm	< 50 mm
Cellular	LTE Band 13	782	18.00	63	1.1	3			4	9.2	< 50 mm	< 50 mm			< 50 mm	< 50 mm

Note(s):

1. According to KDB 447498, if the calculated Power threshold is less than the output power then SAR testing is required.
2. Corner side is located between Edge 1 and Edge4.

SAR Test Exclusion Calculations for WLAN

Antenna < 50mm to adjacent edges

Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)						Calculated Threshold Value					
		dBm	mW	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front
Wi-Fi Main Antenna Max Power															
Wi-Fi 2.4 GHz	2462	16.50	45	1.8	4	54.5	201.5	60.5		14.1 -MEASURE-	14.1 -MEASURE-	> 50 mm	> 50 mm	> 50 mm	
Wi-Fi 5.3 GHz	5320	13.50	22	1.8	4	54.5	201.5	60.5		10.1 -MEASURE-	10.1 -MEASURE-	> 50 mm	> 50 mm	> 50 mm	
Wi-Fi 5.5 GHz	5720	13.50	22	1.8	4	54.5	201.5	60.5		10.5 -MEASURE-	10.5 -MEASURE-	> 50 mm	> 50 mm	> 50 mm	
Wi-Fi 5.8 GHz	5825	13.50	22	1.8	4	54.5	201.5	60.5		10.6 -MEASURE-	10.6 -MEASURE-	> 50 mm	> 50 mm	> 50 mm	
Bluetooth	2480	8.00	6	1.8	4	54.5	201.5	60.5		1.9 -EXEMPT-	1.9 -EXEMPT-	> 50 mm	> 50 mm	> 50 mm	
Wi-Fi Main Antenna Reduced Power															
Wi-Fi 2.4 GHz	2462	12.50	18	1.8						5.6 -MEASURE-					
Wi-Fi 5.3 GHz	5320	12.00	16	1.8						7.4 -MEASURE-					
Wi-Fi 5.5 GHz	5720	12.00	16	1.8						7.7 -MEASURE-					
Wi-Fi 5.8 GHz	5825	12.00	16	1.8						7.7 -MEASURE-					

Note(s):

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

This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

Antenna > 50mm to adjacent edges

Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)						Calculated Threshold Value					
		dBm	mW	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front
Wi-Fi Main Antenna Max Power															
Wi-Fi 2.4 GHz	2462	16.50	45	1.8	4	54.5	201.5	60.5		< 50 mm	< 50 mm	140.6 mW -EXEMPT-	1610.6 mW -EXEMPT-	200.6 mW -EXEMPT-	
Wi-Fi 5.3 GHz	5320	13.50	22	1.8	4	54.5	201.5	60.5		< 50 mm	< 50 mm	110 mW -EXEMPT-	1580 mW -EXEMPT-	170 mW -EXEMPT-	
Wi-Fi 5.5 GHz	5720	13.50	22	1.8	4	54.5	201.5	60.5		< 50 mm	< 50 mm	107.7 mW -EXEMPT-	1577.7 mW -EXEMPT-	167.7 mW -EXEMPT-	
Wi-Fi 5.8 GHz	5825	13.50	22	1.8	4	54.5	201.5	60.5		< 50 mm	< 50 mm	107.2 mW -EXEMPT-	1577.2 mW -EXEMPT-	167.2 mW -EXEMPT-	
Bluetooth	2480	8.00	6	1.8	4	54.5	201.5	60.5		< 50 mm	< 50 mm	140.3 mW -EXEMPT-	1610.3 mW -EXEMPT-	200.3 mW -EXEMPT-	
Wi-Fi Main Antenna Reduced Power															
Wi-Fi 2.4 GHz	2462	12.50	18	1.8						< 50 mm					
Wi-Fi 5.3 GHz	5320	12.00	16	1.8						< 50 mm					
Wi-Fi 5.5 GHz	5720	12.00	16	1.8						< 50 mm					
Wi-Fi 5.8 GHz	5825	12.00	16	1.8						< 50 mm					

Note(s):

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

This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

7.2. Required Test Configurations

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

Test Configurations	Pwr Back-off	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Corner side
			(Top Edge)	(Right Edge)	(Bottom Edge)	(Left Edge)	Note 2
WCDMA Band II	Off	Yes	Yes	No	No	Yes	Yes
	On	Yes	Yes	No	No	Yes	No
WCDMA Band V	Off	Yes	Yes	No	No	Yes	Yes
	On	Yes	Yes	No	No	Yes	Yes
LTE Band 2	Off	Yes	Yes	No	No	Yes	Yes
	On	Yes	Yes	No	No	Yes	No
LTE Band 4	Off	Yes	Yes	No	No	Yes	Yes
	On	Yes	Yes	No	No	Yes	No
LTE Band 5	Off	Yes	Yes	No	No	Yes	Yes
	On	Yes	Yes	No	No	Yes	Yes
LTE Band 7	Off	Yes	Yes	No	No	Yes	Yes
	On	Yes	Yes	No	No	Yes	Yes
LTE Band 13	Off	Yes	Yes	No	No	Yes	Yes
	On	Yes	Yes	No	No	Yes	Yes
Wi-Fi 2.4 GHz	Off	Yes	Yes	No	No	No	No
	On	Yes	No	No	No	No	No
Wi-Fi 5 GHz	Off	Yes	Yes	No	No	No	No
	On	Yes	No	No	No	No	No
Bluetooth	Off	No	No	No	No	No	No

Note(s):

1. Yes = Testing is required. No = Testing is not required.
2. Corner side is located between Edge 1 and Edge 4.

This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

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 ± 2°C of the temperature when the tissue parameters are characterized.

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

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

Tissue Dielectric Parameters

FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz

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

IEEE Std 1528-2013

Refer to Table 3 within the IEEE Std 1528-2013

This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

Dielectric Property Measurements Results:

SAR 1 Room

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
09-04-2017	Body 5180	e'	47.3200	Relative Permittivity (ε_r):	47.32	49.05	-3.52	5
		e''	18.2800	Conductivity (σ):	5.27	5.27	-0.12	5
	Body 5300	e'	47.1200	Relative Permittivity (ε_r):	47.12	48.88	-3.61	5
		e''	18.3800	Conductivity (σ):	5.42	5.41	0.10	5
	Body 5600	e'	46.6600	Relative Permittivity (ε_r):	46.66	48.48	-3.75	5
		e''	18.6200	Conductivity (σ):	5.80	5.76	0.64	5
	Body 5800	e'	46.3800	Relative Permittivity (ε_r):	46.38	48.20	-3.78	5
		e''	18.8300	Conductivity (σ):	6.07	6.00	1.21	5
	Body 5825	e'	46.3300	Relative Permittivity (ε_r):	46.33	48.20	-3.88	5
		e''	18.8500	Conductivity (σ):	6.11	6.00	1.75	5

SAR 2 Room

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
08-17-2017	Body 835	e'	55.4500	Relative Permittivity (ε_r):	55.45	55.20	0.45	5
		e''	21.7500	Conductivity (σ):	1.01	0.97	4.11	5
	Body 820	e'	55.5900	Relative Permittivity (ε_r):	55.59	55.28	0.57	5
		e''	21.8500	Conductivity (σ):	1.00	0.97	2.87	5
	Body 850	e'	55.3100	Relative Permittivity (ε_r):	55.31	55.16	0.28	5
		e''	21.6300	Conductivity (σ):	1.02	0.99	3.56	5
08-21-2017	Body 835	e'	53.3800	Relative Permittivity (ε_r):	53.38	55.20	-3.30	5
		e''	21.4600	Conductivity (σ):	1.00	0.97	2.72	5
	Body 820	e'	53.4900	Relative Permittivity (ε_r):	53.49	55.28	-3.23	5
		e''	21.4900	Conductivity (σ):	0.98	0.97	1.17	5
	Body 850	e'	53.2900	Relative Permittivity (ε_r):	53.29	55.16	-3.39	5
		e''	21.4300	Conductivity (σ):	1.01	0.99	2.60	5
08-21-2017	Body 2600	e'	52.2700	Relative Permittivity (ε_r):	52.27	52.51	-0.46	5
		e''	15.3000	Conductivity (σ):	2.21	2.16	2.36	5
	Body 2500	e'	52.5500	Relative Permittivity (ε_r):	52.55	52.64	-0.17	5
		e''	14.9900	Conductivity (σ):	2.08	2.02	3.14	5
	Body 2700	e'	51.9500	Relative Permittivity (ε_r):	51.95	52.38	-0.83	5
		e''	15.5400	Conductivity (σ):	2.33	2.30	1.38	5
09-04-2017	Body 2450	e'	52.1600	Relative Permittivity (ε_r):	52.16	52.70	-1.02	5
		e''	14.9400	Conductivity (σ):	2.04	1.95	4.37	5
	Body 2400	e'	52.2700	Relative Permittivity (ε_r):	52.27	52.77	-0.95	5
		e''	14.8200	Conductivity (σ):	1.98	1.90	4.20	5
	Body 2480	e'	52.0580	Relative Permittivity (ε_r):	52.06	52.66	-1.15	5
		e''	15.0300	Conductivity (σ):	2.07	1.99	4.04	5
2017-09-07	Body 750	e'	54.5900	Relative Permittivity (ε_r):	54.59	55.55	-1.72	5
		e''	23.1900	Conductivity (σ):	0.97	0.96	0.42	5
	Body 700	e'	55.1100	Relative Permittivity (ε_r):	55.11	55.74	-1.13	5
		e''	23.6500	Conductivity (σ):	0.92	0.96	-4.04	5
	Body 790	e'	54.1600	Relative Permittivity (ε_r):	54.16	55.39	-2.22	5
		e''	22.8200	Conductivity (σ):	1.00	0.97	3.75	5
2017-09-07	Body 835	e'	53.1900	Relative Permittivity (ε_r):	53.19	55.20	-3.64	5
		e''	21.4000	Conductivity (σ):	0.99	0.97	2.43	5
	Body 820	e'	53.3000	Relative Permittivity (ε_r):	53.30	55.28	-3.58	5
		e''	21.4700	Conductivity (σ):	0.98	0.97	1.08	5
	Body 850	e'	53.1100	Relative Permittivity (ε_r):	53.11	55.16	-3.71	5
		e''	21.3300	Conductivity (σ):	1.01	0.99	2.12	5
2017-09-07	Body 2600	e'	52.5600	Relative Permittivity (ε_r):	52.56	52.51	0.09	5
		e''	15.4100	Conductivity (σ):	2.23	2.16	3.10	5
	Body 2500	e'	52.8000	Relative Permittivity (ε_r):	52.80	52.64	0.31	5
		e''	15.1800	Conductivity (σ):	2.11	2.02	4.45	5
	Body 2700	e'	52.2900	Relative Permittivity (ε_r):	52.29	52.38	-0.18	5
		e''	15.6900	Conductivity (σ):	2.36	2.30	2.35	5

This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

SAR 2 Room(continued)

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
2017-09-13	Body 2600	e'	51.0000	Relative Permittivity (ε_r):	51.00	52.51	-2.88	5
		e''	14.5700	Conductivity (σ):	2.11	2.16	-2.52	5
	Body 2500	e'	51.2500	Relative Permittivity (ε_r):	51.25	52.64	-2.63	5
		e''	14.3600	Conductivity (σ):	2.00	2.02	-1.19	5
	Body 2700	e'	50.7300	Relative Permittivity (ε_r):	50.73	52.38	-3.16	5
		e''	14.7700	Conductivity (σ):	2.22	2.30	-3.65	5
2017-09-14	Body 750	e'	54.4900	Relative Permittivity (ε_r):	54.49	55.55	-1.90	5
		e''	23.0900	Conductivity (σ):	0.96	0.96	-0.02	5
	Body 700	e'	55.0400	Relative Permittivity (ε_r):	55.04	55.74	-1.25	5
		e''	23.4800	Conductivity (σ):	0.91	0.96	-4.73	5
	Body 790	e'	54.0400	Relative Permittivity (ε_r):	54.04	55.39	-2.44	5
		e''	22.7900	Conductivity (σ):	1.00	0.97	3.62	5
2017-09-14	Body 835	e'	53.2300	Relative Permittivity (ε_r):	53.23	55.20	-3.57	5
		e''	21.5800	Conductivity (σ):	1.00	0.97	3.29	5
	Body 820	e'	53.3700	Relative Permittivity (ε_r):	53.37	55.28	-3.45	5
		e''	21.6200	Conductivity (σ):	0.99	0.97	1.79	5
	Body 850	e'	53.0800	Relative Permittivity (ε_r):	53.08	55.16	-3.77	5
		e''	21.5400	Conductivity (σ):	1.02	0.99	3.13	5

This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

SAR 3 Room

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
08-17-2017	Body 1900	e'	52.9900	Relative Permittivity (ε_r):	52.99	53.30	-0.58	5
		e''	14.9400	Conductivity (σ):	1.58	1.52	3.84	5
	Body 1850	e'	53.1200	Relative Permittivity (ε_r):	53.12	53.30	-0.34	5
		e''	14.9200	Conductivity (σ):	1.53	1.52	0.97	5
	Body 1910	e'	52.9700	Relative Permittivity (ε_r):	52.97	53.30	-0.62	5
		e''	14.9500	Conductivity (σ):	1.59	1.52	4.46	5
08-21-2017	Body 1750	e'	54.2100	Relative Permittivity (ε_r):	54.21	53.44	1.44	5
		e''	14.9700	Conductivity (σ):	1.46	1.49	-1.98	5
	Body 1710	e'	54.3600	Relative Permittivity (ε_r):	54.36	53.54	1.52	5
		e''	14.9500	Conductivity (σ):	1.42	1.46	-2.74	5
	Body 1755	e'	54.1900	Relative Permittivity (ε_r):	54.19	53.43	1.43	5
		e''	14.9600	Conductivity (σ):	1.46	1.49	-1.97	5
08-21-2017	Body 1900	e'	53.7900	Relative Permittivity (ε_r):	53.79	53.30	0.92	5
		e''	14.9700	Conductivity (σ):	1.58	1.52	4.05	5
	Body 1850	e'	53.8800	Relative Permittivity (ε_r):	53.88	53.30	1.09	5
		e''	14.9900	Conductivity (σ):	1.54	1.52	1.44	5
	Body 1910	e'	53.7900	Relative Permittivity (ε_r):	53.79	53.30	0.92	5
		e''	14.9900	Conductivity (σ):	1.59	1.52	4.73	5
08-24-2017	Body 750	e'	55.6000	Relative Permittivity (ε_r):	55.60	55.55	0.10	5
		e''	23.2600	Conductivity (σ):	0.97	0.96	0.72	5
	Body 700	e'	56.1400	Relative Permittivity (ε_r):	56.14	55.74	0.72	5
		e''	23.6700	Conductivity (σ):	0.92	0.96	-3.96	5
	Body 790	e'	55.1800	Relative Permittivity (ε_r):	55.18	55.39	-0.38	5
		e''	22.9600	Conductivity (σ):	1.01	0.97	4.39	5
08-28-2017	Body 1900	e'	53.9600	Relative Permittivity (ε_r):	53.96	53.30	1.24	5
		e''	14.9200	Conductivity (σ):	1.58	1.52	3.70	5
	Body 1850	e'	54.0900	Relative Permittivity (ε_r):	54.09	53.30	1.48	5
		e''	14.8700	Conductivity (σ):	1.53	1.52	0.63	5
	Body 1910	e'	53.9200	Relative Permittivity (ε_r):	53.92	53.30	1.16	5
		e''	14.9400	Conductivity (σ):	1.59	1.52	4.39	5
08-31-2017	Body 1750	e'	52.6800	Relative Permittivity (ε_r):	52.68	53.44	-1.42	5
		e''	15.3200	Conductivity (σ):	1.49	1.49	0.31	5
	Body 1710	e'	52.7600	Relative Permittivity (ε_r):	52.76	53.54	-1.46	5
		e''	15.2700	Conductivity (σ):	1.45	1.46	-0.66	5
	Body 1755	e'	52.6700	Relative Permittivity (ε_r):	52.67	53.43	-1.42	5
		e''	15.3200	Conductivity (σ):	1.49	1.49	0.39	5
09-11-2017	Body 1900	e'	51.5800	Relative Permittivity (ε_r):	51.58	53.30	-3.23	5
		e''	14.9800	Conductivity (σ):	1.58	1.52	4.12	5
	Body 1850	e'	51.7300	Relative Permittivity (ε_r):	51.73	53.30	-2.95	5
		e''	15.0000	Conductivity (σ):	1.54	1.52	1.51	5
	Body 1910	e'	51.5500	Relative Permittivity (ε_r):	51.55	53.30	-3.28	5
		e''	14.9800	Conductivity (σ):	1.59	1.52	4.66	5
09-11-2017	Body 1750	e'	52.0900	Relative Permittivity (ε_r):	52.09	53.44	-2.53	5
		e''	14.8800	Conductivity (σ):	1.45	1.49	-2.57	5
	Body 1710	e'	52.1700	Relative Permittivity (ε_r):	52.17	53.54	-2.57	5
		e''	14.8500	Conductivity (σ):	1.41	1.46	-3.39	5
	Body 1755	e'	52.0700	Relative Permittivity (ε_r):	52.07	53.43	-2.54	5
		e''	14.8900	Conductivity (σ):	1.45	1.49	-2.43	5

This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

SAR 3 Room(continued)

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
2017-09-13	Body 1900	e'	53.9600	Relative Permittivity (ε_r):	53.96	53.30	1.24	5
		e''	14.8700	Conductivity (σ):	1.57	1.52	3.35	5
	Body 1850	e'	54.1200	Relative Permittivity (ε_r):	54.12	53.30	1.54	5
		e''	14.8500	Conductivity (σ):	1.53	1.52	0.50	5
	Body 1910	e'	53.9300	Relative Permittivity (ε_r):	53.93	53.30	1.18	5
		e''	14.8900	Conductivity (σ):	1.58	1.52	4.04	5
2017-09-13	Body 1750	e'	54.4900	Relative Permittivity (ε_r):	54.49	53.44	1.96	5
		e''	14.6800	Conductivity (σ):	1.43	1.49	-3.88	5
	Body 1710	e'	54.5900	Relative Permittivity (ε_r):	54.59	53.54	1.95	5
		e''	14.6100	Conductivity (σ):	1.39	1.46	-4.95	5
	Body 1755	e'	54.4800	Relative Permittivity (ε_r):	54.48	53.43	1.97	5
		e''	14.7000	Conductivity (σ):	1.43	1.49	-3.68	5

This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

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.

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

Reference Target SAR Values

System Dipole	Serial No.	Cal. Date	Freq. (MHz)	Target SAR Values (W/kg)	
				1g/10g	Body
D750V3	1122	8-30-2016	750	1g	8.69
				10g	5.72
D835V2	4d174	9-28-2016	835	1g	9.57
				10g	6.28
D835V2	4d194	7-19-2017	835	1g	9.30
				10g	6.09
D1750V2	1125	8-26-2016	1750	1g	37.20
				10g	19.80
D1900V2	5d190	9-28-2016	1900	1g	38.80
				10g	20.60
D1900V2	5d199	2-21-2017	1900	1g	40.40
				10g	21.30
D2450V2	939	9-23-2016	2450	1g	49.90
				10g	23.70
D2600V2	1097	11-15-2016	2600	1g	54.90
				10g	24.60
D5GHzV2	1209	2-24-2017	5300	1g	72.90
				10g	20.40
D5GHzV2	1209	2-24-2017	5600	1g	75.20
				10g	21.10
D5GHzV2	1209	2-24-2017	5800	1g	73.50
				10g	20.40

Note(s):

Refer to Appendix F that mentioned about justification for Extended SAR Dipole Calibrations(D750V2, SN : 1122 and D1750V2, SN : 1125).

This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

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			
09-04-2017	D5GHzV2 (5300)	1209	Body	1g	7.86	78.6	72.9	7.82	1,2
				10g	2.21	22.1	20.4	8.33	
09-04-2017	D5GHzV2 (5600)	1209	Body	1g	8.09	80.9	75.2	7.58	
				10g	2.26	22.6	21.1	7.11	
09-04-2017	D5GHzV2 (5800)	1209	Body	1g	7.54	75.4	73.5	2.59	
				10g	2.11	21.1	20.4	3.43	

SAR 2 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			
08-17-2017	D835V2	4d174	Body	1g	1.02	10.20	9.57	6.58	
				10g	0.67	6.67	6.28	6.21	
08-21-2017	D835V2	4d174	Body	1g	0.98	9.82	9.57	2.61	
				10g	0.65	6.45	6.28	2.71	
08-21-2017	D2600V2	1097	Body	1g	5.71	57.10	54.90	4.01	3,4
				10g	2.52	25.20	24.60	2.44	
09-04-2017	D2450V2	939	Body	1g	5.37	53.70	49.90	7.62	5,6
				10g	2.45	24.50	23.70	3.38	
09-07-2017	D750V2	1122	Body	1g	0.84	8.40	8.69	-3.34	7,8
				10g	0.56	5.60	5.72	-2.10	
09-07-2017	D835V2	4d174	Body	1g	1.00	10.00	9.57	4.49	
				10g	0.66	6.61	6.28	5.25	
09-07-2017	D2600V2	1097	Body	1g	5.65	56.50	54.90	2.91	
				10g	2.47	24.70	24.60	0.41	
09-13-2017	D2600V2	1097	Body	1g	5.58	55.80	54.90	1.64	
				10g	2.42	24.20	24.60	-1.63	
09-14-2017	D750V2	1122	Body	1g	0.84	8.42	8.69	-3.11	
				10g	0.56	5.61	5.72	-1.92	
09-14-2017	D835V2	4d194	Body	1g	0.99	9.92	9.30	6.67	9,10
				10g	0.65	6.52	6.09	7.06	

This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

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			
08-17-2017	D1900V2	5d190	Body	1g	3.94	39.40	38.80	1.55	
				10g	2.02	20.20	20.60	-1.94	
08-21-2017	D1750V2	1125	Body	1g	3.45	34.50	37.20	-7.26	11,12
				10g	1.83	18.30	19.80	-7.58	
08-21-2017	D1900V2	5d190	Body	1g	3.96	39.60	38.80	2.06	
				10g	2.03	20.30	20.60	-1.46	
08-24-2017	D750V2	1122	Body	1g	0.87	8.73	8.69	0.46	
				10g	0.58	5.79	5.72	1.22	
08-28-2017	D1900V2	5d190	Body	1g	3.78	37.80	38.80	-2.58	
				10g	1.94	19.40	20.60	-5.83	
08-31-2017	D1750V2	1125	Body	1g	3.45	34.50	37.20	-7.26	
				10g	1.84	18.40	19.80	-7.07	
09-11-2017	D1900V2	5d199	Body	1g	3.87	38.70	40.40	-4.21	13,14
				10g	1.98	19.80	21.30	-7.04	
09-11-2017	D1750V2	1125	Body	1g	3.47	34.70	37.20	-6.72	
				10g	1.84	18.40	19.80	-7.07	
09-13-2017	D1900V2	5d199	Body	1g	3.91	39.10	40.40	-3.22	
				10g	2.00	20.00	21.30	-6.10	
09-13-2017	D1750V2	1125	Body	1g	3.50	35.00	37.20	-5.91	
				10g	1.85	18.50	19.80	-6.57	

This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

9. Conducted Output Power Measurements

9.1. 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
	βc/βd	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			
	βc	2/15	11/15	15/15	15/15
	βd	15/15	15/15	8/15	4/15
	Bd (SF)	64			
	βc/βd	2/15	11/15	15/8	15/4
	βhs	4/15	24/15	30/15	30/15
	MPR (dB)	0	0	0.5	0.5
HSDPA Specific Settings	D_{ACK}	8			
	D_{NAK}	8			
	DCQI	8			
	Ack-Nack repetition factor	3			
	CQI Feedback (Table 5.2B.4)	4ms			
	CQI Repetition Factor (Table 5.2B.4)	2			
	Ahs=βhs/βc	30/15			

This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

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 TS34.121-1 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
	βc	11/15	6/15	15/15	2/15	15/15
	βd	15/15	15/15	9/15	15/15	0
	βec	209/225	12/15	30/15	2/15	5/15
	βc/βd	11/15	6/15	15/9	2/15	-
	βhs	22/15	12/15	30/15	4/15	5/15
	βed	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				
	Ahs = βhs/βc	30/15				
HSUPA Specific Settings	E-DPDCCH	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

This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

W-CDMA Band II Measured Results

Band	Mode		UL Ch No.	Freq. (MHz)	Max. Pwr		Reduction. Pwr	
					MPR (dB)	Avg. Pwr (dBm)	MPR (dB)	Avg. Pwr (dBm)
W-CDMA Band II	Rel 99	RMC, 12.2 kbps	9262	1852.4	N/A	21.97	0	11.00
			9400	1880.0	N/A	22.13	0	10.92
			9538	1907.6	N/A	22.61	0	10.94
	HSDPA	Subtest 1	9262	1852.4	0	21.84	0	10.95
			9400	1880.0	0	21.95	0	10.88
			9538	1907.6	0	22.50	0	11.31
		Subtest 2	9262	1852.4	0	21.68	0	11.02
			9400	1880.0	0	21.86	0	10.96
			9538	1907.6	0	22.33	0	11.36
		Subtest 3	9262	1852.4	0.5	21.39	0	11.03
			9400	1880.0	0.5	21.28	0	11.01
			9538	1907.6	0.5	21.88	0	11.36
		Subtest 4	9262	1852.4	0.5	20.63	0	11.05
			9400	1880.0	0.5	20.49	0	11.00
			9538	1907.6	0.5	21.08	0	11.38
	HSUPA	Subtest 1	9262	1852.4	0	20.88	0	11.00
			9400	1880.0	0	20.97	0	10.93
			9538	1907.6	0	21.72	0	11.41
		Subtest 2	9262	1852.4	2	18.70	0	11.07
			9400	1880.0	2	18.57	0	10.99
			9538	1907.6	2	19.25	0	11.44
		Subtest 3	9262	1852.4	1	19.68	0	11.03
			9400	1880.0	1	19.62	0	10.95
			9538	1907.6	1	20.32	0	11.44
		Subtest 4	9262	1852.4	2	18.70	0	11.06
			9400	1880.0	2	18.50	0	11.00
			9538	1907.6	2	19.27	0	11.46
		Subtest 5	9262	1852.4	0	21.61	0	11.04
			9400	1880.0	0	21.50	0	10.93
			9538	1907.6	0	22.26	0	11.41

This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

W-CDMA Band V Measured Results

Band	Mode		UL Ch No.	Freq. (MHz)	Max. Pwr		Reduction. Pwr	
					MPR (dB)	Avg. Pwr (dBm)	MPR (dB)	Avg. Pwr (dBm)
W-CDMA Band V	Rel 99	RMC, 12.2 kbps	4132	826.4	N/A	22.94	0	18.01
			4183	836.6	N/A	22.95	0	17.74
			4233	846.6	N/A	22.95	0	17.76
	HSDPA	Subtest 1	4132	826.4	0	21.98	0	17.98
			4183	836.6	0	21.91	0	17.65
			4233	846.6	0	21.87	0	17.48
		Subtest 2	4132	826.4	0	22.71	0	18.01
			4183	836.6	0	22.57	0	17.70
			4233	846.6	0	22.40	0	17.52
		Subtest 3	4132	826.4	0.5	21.94	0	18.00
			4183	836.6	0.5	21.83	0	17.74
			4233	846.6	0.5	21.76	0	17.59
		Subtest 4	4132	826.4	0.5	21.58	0	18.00
			4183	836.6	0.5	21.38	0	17.77
			4233	846.6	0.5	21.30	0	17.55
	HSUPA	Subtest 1	4132	826.4	0	21.59	0	17.01
			4183	836.6	0	21.61	0	16.89
			4233	846.6	0	21.55	0	16.70
		Subtest 2	4132	826.4	2	18.33	0	17.06
			4183	836.6	2	18.23	0	16.99
			4233	846.6	2	18.33	0	16.85
		Subtest 3	4132	826.4	1	19.71	0	17.01
			4183	836.6	1	19.61	0	16.93
			4233	846.6	1	19.55	0	16.79
		Subtest 4	4132	826.4	2	18.36	0	17.04
			4183	836.6	2	18.24	0	17.01
			4233	846.6	2	18.19	0	16.84
		Subtest 5	4132	826.4	0	21.59	0	18.01
			4183	836.6	0	21.45	0	17.73
			4233	846.6	0	21.40	0	17.54

This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

9.2. LTE

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

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

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

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

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

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

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

This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

LTE Band 2 Measured Results

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)			Target MPR	Reduction. Avg Pwr (dBm)		
						1860 MHz	1880 MHz	1900 MHz		1860 MHz	1880 MHz	1900 MHz
LTE Band 2	20	QPSK	1	0	0	22.99	22.68	23.06	0	10.58	10.44	10.80
			1	49	0	22.99	22.75	23.14	0	10.60	10.40	10.87
			1	99	0	22.98	22.82	22.27	0	10.63	10.50	10.01
			50	0	1	21.99	21.67	22.15	0	10.60	10.41	10.81
			50	24	1	21.99	21.68	22.20	0	10.60	10.40	10.85
			50	50	1	22.00	21.71	22.25	0	10.60	10.43	10.87
			100	0	1	21.99	21.68	22.18	0	10.61	10.45	10.81
		16QAM	1	0	1	22.03	21.78	22.26	0	10.62	10.44	10.72
			1	49	1	22.00	21.66	22.16	0	10.52	10.43	10.81
			1	99	1	22.14	21.80	21.69	0	10.71	10.51	10.28
			50	0	2	21.01	20.73	21.21	0	10.57	10.34	10.78
			50	24	2	21.04	20.73	21.26	0	10.59	10.33	10.80
			50	50	2	21.04	20.71	21.29	0	10.60	10.33	10.84
			100	0	2	21.07	20.74	21.26	0	10.65	10.43	10.83
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)			Target MPR	Reduction. Avg Pwr (dBm)		
						1857.5 MHz	1880 MHz	1902.5 MHz		1857.5 MHz	1880 MHz	1902.5 MHz
LTE Band 2	15	QPSK	1	0	0	22.97	22.73	23.20	0	10.59	10.41	10.88
			1	37	0	23.01	22.69	23.29	0	10.63	10.41	10.94
			1	74	0	23.00	22.68	22.69	0	10.63	10.44	10.85
			36	0	1	21.97	21.69	22.15	0	10.63	10.39	10.86
			36	20	1	21.95	21.66	22.21	0	10.62	10.39	10.87
			36	39	1	21.96	21.69	22.23	0	10.61	10.39	10.90
			75	0	1	21.93	21.65	22.23	0	10.61	10.40	10.87
		16QAM	1	0	1	21.81	21.90	22.15	0	10.51	10.49	10.60
			1	37	1	21.87	21.90	22.27	0	10.57	10.67	10.88
			1	74	1	21.87	22.05	22.00	0	10.49	10.78	11.07
			36	0	2	20.95	20.69	21.26	0	10.55	10.33	10.90
			36	20	2	20.96	20.66	21.26	0	10.56	10.32	10.89
			36	39	2	20.96	20.66	21.27	0	10.57	10.37	10.89
			75	0	2	20.96	20.70	21.22	0	10.59	10.37	10.83
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)			Target MPR	Reduction. Avg Pwr (dBm)		
						1855 MHz	1880 MHz	1905 MHz		1855 MHz	1880 MHz	1905 MHz
LTE Band 2	10	QPSK	1	0	0	23.07	22.70	23.28	0	10.67	10.43	11.01
			1	25	0	23.09	22.69	23.30	0	10.60	10.48	10.97
			1	49	0	23.13	22.70	22.56	0	10.68	10.49	11.08
			25	0	1	21.99	21.66	22.21	0	10.57	10.41	10.96
			25	12	1	21.99	21.65	22.23	0	10.57	10.41	10.94
			25	25	1	21.99	21.66	22.23	0	10.58	10.41	10.97
			50	0	1	21.99	21.67	22.22	0	10.58	10.40	10.93
		16QAM	1	0	1	22.04	21.64	22.29	0	10.48	10.35	11.03
			1	25	1	21.95	21.84	22.09	0	10.55	10.42	10.98
			1	49	1	21.97	21.85	21.85	0	10.57	10.53	11.27
			25	0	2	21.02	20.76	21.27	0	10.58	10.45	11.02
			25	12	2	21.05	20.79	21.28	0	10.61	10.49	11.00
			25	25	2	21.04	20.80	21.30	0	10.63	10.52	11.01
			50	0	2	21.00	20.75	21.21	0	10.58	10.45	10.92

This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

LTE Band 2 Measured Results (continued)

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)			Target MPR	Reduction. Avg Pwr (dBm)		
						1852.5 MHz	1880 MHz	1907.5 MHz		1852.5 MHz	1880 MHz	1907.5 MHz
LTE Band 2	5	QPSK	1	0	0	23.11	22.61	23.33	0	10.71	10.43	11.00
			1	12	0	23.11	22.63	23.34	0	10.70	10.40	11.03
			1	24	0	23.16	22.69	23.31	0	10.72	10.47	11.09
			12	0	1	22.02	21.63	22.29	0	10.61	10.40	11.02
			12	7	1	22.00	21.65	22.33	0	10.64	10.39	11.00
			12	13	1	22.04	21.64	22.32	0	10.65	10.40	11.03
			25	0	1	22.03	21.63	22.31	0	10.65	10.40	11.01
		16QAM	1	0	1	21.97	21.79	22.28	0	10.52	10.38	10.99
			1	12	1	21.94	21.91	22.38	0	10.65	10.37	11.06
			1	24	1	21.95	21.72	22.31	0	10.49	10.35	11.09
			12	0	2	21.01	20.61	21.32	0	10.55	10.34	10.93
			12	7	2	20.94	20.64	21.29	0	10.57	10.38	10.98
			12	13	2	20.95	20.62	21.31	0	10.64	10.37	10.95
			25	0	2	21.09	20.64	21.38	0	10.65	10.40	10.99
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)			Target MPR	Reduction. Avg Pwr (dBm)		
						1851.5 MHz	1880 MHz	1908.5 MHz		1851.5 MHz	1880 MHz	1908.5 MHz
LTE Band 2	3	QPSK	1	0	0	23.10	22.70	23.39	0	10.70	10.53	11.21
			1	8	0	23.11	22.78	23.41	0	10.71	10.57	11.22
			1	14	0	23.11	22.77	23.43	0	10.70	10.52	11.19
			8	0	1	22.01	21.63	22.28	0	10.62	10.49	11.10
			8	4	1	21.99	21.62	22.28	0	10.64	10.45	11.09
			8	7	1	21.98	21.60	22.30	0	10.62	10.44	11.07
			15	0	1	22.00	21.60	22.29	0	10.64	10.43	11.07
		16QAM	1	0	1	21.72	21.88	22.12	0	10.58	10.38	11.17
			1	8	1	21.90	21.93	22.22	0	10.57	10.57	10.96
			1	14	1	21.91	21.92	22.36	0	10.59	10.62	10.99
			8	0	2	21.03	20.67	21.17	0	10.64	10.48	10.98
			8	4	2	21.03	20.71	21.15	0	10.58	10.53	11.00
			8	7	2	21.02	20.73	21.17	0	10.58	10.51	11.00
			15	0	2	21.05	20.67	21.29	0	10.59	10.37	11.06
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)			Target MPR	Reduction. Avg Pwr (dBm)		
						1850.7 MHz	1880 MHz	1909.3 MHz		1850.7 MHz	1880 MHz	1909.3 MHz
LTE Band 2	1.4	QPSK	1	0	0	23.07	22.65	23.32	0	10.76	10.60	11.13
			1	3	0	23.02	22.66	23.28	0	10.83	10.67	11.19
			1	5	0	23.01	22.67	23.28	0	10.76	10.63	11.15
			3	0	0	22.99	22.63	23.29	0	10.73	10.54	11.13
			3	1	0	23.06	22.65	23.33	0	10.76	10.60	11.15
			3	3	0	23.05	22.66	23.32	0	10.73	10.60	11.18
			6	0	1	22.01	21.62	22.23	0	10.73	10.54	11.12
		16QAM	1	0	1	21.86	21.68	22.36	0	10.69	10.44	11.06
			1	3	1	21.83	21.66	22.45	0	10.73	10.50	11.02
			1	5	1	22.04	21.65	22.04	0	10.75	10.53	11.11
			3	0	1	22.02	21.78	22.12	0	10.76	10.49	11.06
			3	1	1	22.04	21.68	22.38	0	10.80	10.64	11.14
			3	3	1	22.02	21.84	22.35	0	10.76	10.54	11.18
			6	0	2	21.12	20.70	21.15	0	10.82	10.45	11.12

This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

LTE Band 4 Measured Results

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)			Target MPR	Reduction. Avg Pwr (dBm)		
						1720 MHz	1732.5 MHz	1745 MHz		1720 MHz	1732.5 MHz	1745 MHz
LTE Band 4	20	QPSK	1	0	0		23.39		0		11.51	
			1	49	0		23.38		0		11.57	
			1	99	0		23.44		0		11.67	
			50	0	1		22.39		0		11.57	
			50	24	1		22.39		0		11.58	
			50	50	1		22.40		0		11.57	
			100	0	1		22.39		0		11.58	
		16QAM	1	0	1		22.50		0		11.58	
			1	49	1		22.55		0		11.69	
			1	99	1		22.60		0		11.66	
			50	0	2		21.40		0		11.52	
			50	24	2		21.41		0		11.52	
			50	50	2		21.38		0		11.52	
			100	0	2		21.45		0		11.58	

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)			Target MPR	Reduction. Avg Pwr (dBm)		
						1717.5 MHz	1732.5 MHz	1747.5 MHz		1717.5 MHz	1732.5 MHz	1747.5 MHz
LTE Band 4	15	QPSK	1	0	0	23.55	23.39	23.61	0	11.60	11.62	11.90
			1	37	0	23.56	23.42	23.55	0	11.59	11.59	11.93
			1	74	0	23.56	23.42	23.58	0	11.63	11.59	12.00
			36	0	1	22.50	22.42	22.54	0	11.55	11.55	11.88
			36	20	1	22.53	22.41	22.55	0	11.55	11.60	11.89
			36	39	1	22.52	22.42	22.56	0	11.57	11.60	11.89
			75	0	1	22.49	22.40	22.55	0	11.56	11.59	11.89
		16QAM	1	0	1	22.47	22.55	22.40	0	11.62	11.38	11.97
			1	37	1	22.36	22.69	22.56	0	11.68	11.50	11.81
			1	74	1	22.42	22.74	22.42	0	11.59	11.48	11.72
			36	0	2	21.48	21.37	21.59	0	11.59	11.56	11.92
			36	20	2	21.50	21.40	21.60	0	11.59	11.55	11.93
			36	39	2	21.50	21.39	21.61	0	11.61	11.57	11.91
			75	0	2	21.50	21.40	21.58	0	11.56	11.58	11.87

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)			Target MPR	Reduction. Avg Pwr (dBm)		
						1715 MHz	1732.5 MHz	1750 MHz		1715 MHz	1732.5 MHz	1750 MHz
LTE Band 4	10	QPSK	1	0	0	23.60	23.41	23.65	0	11.53	11.65	11.99
			1	25	0	23.57	23.42	23.60	0	11.57	11.63	11.99
			1	49	0	23.60	23.42	23.64	0	11.60	11.63	12.00
			25	0	1	22.49	22.39	22.57	0	11.54	11.54	11.93
			25	12	1	22.47	22.41	22.56	0	11.53	11.57	11.91
			25	25	1	22.50	22.38	22.57	0	11.53	11.58	11.94
			50	0	1	22.50	22.40	22.56	0	11.55	11.58	11.92
		16QAM	1	0	1	22.60	22.36	22.68	0	11.47	11.52	11.89
			1	25	1	22.41	22.83	22.66	0	11.55	11.70	11.84
			1	49	1	22.34	22.83	22.73	0	11.53	11.70	11.86
			25	0	2	21.56	21.49	21.59	0	11.55	11.61	11.93
			25	12	2	21.57	21.51	21.57	0	11.57	11.59	11.95
			25	25	2	21.57	21.53	21.61	0	11.57	11.57	11.96
			50	0	2	21.51	21.44	21.55	0	11.56	11.58	11.91

This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

LTE Band 4 Measured Results (continued)

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)			Target MPR	Reduction. Avg Pwr (dBm)		
						1712.5 MHz	1732.5 MHz	1752.5 MHz		1712.5 MHz	1732.5 MHz	1752.5 MHz
LTE Band 4	5	QPSK	1	0	0	23.59	23.36	23.54	0	11.72	11.53	11.92
			1	12	0	23.54	23.40	23.60	0	11.67	11.54	11.96
			1	24	0	23.54	23.43	23.55	0	11.70	11.57	11.90
			12	0	1	22.47	22.37	22.58	0	11.58	11.56	11.89
			12	7	1	22.48	22.39	22.56	0	11.57	11.53	11.92
			12	13	1	22.50	22.37	22.60	0	11.55	11.56	11.92
			25	0	1	22.50	22.38	22.58	0	11.57	11.56	11.92
		16QAM	1	0	1	22.51	22.29	22.48	0	11.43	11.73	11.85
			1	12	1	22.54	22.49	22.59	0	11.39	11.55	11.99
			1	24	1	22.53	22.48	22.62	0	11.56	11.54	11.89
			12	0	2	21.42	21.37	21.65	0	11.56	11.49	11.91
			12	7	2	21.46	21.39	21.67	0	11.55	11.49	11.95
			12	13	2	21.49	21.40	21.65	0	11.53	11.51	11.93
			25	0	2	21.59	21.40	21.60	0	11.64	11.57	11.91
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)			Target MPR	Reduction. Avg Pwr (dBm)		
						1711.5 MHz	1732.5 MHz	1753.5 MHz		1711.5 MHz	1732.5 MHz	1753.5 MHz
LTE Band 4	3	QPSK	1	0	0	23.53	23.42	23.65	0	11.56	11.61	11.96
			1	8	0	23.59	23.45	23.69	0	11.61	11.64	11.99
			1	14	0	23.60	23.47	23.61	0	11.66	11.62	11.97
			8	0	1	22.47	22.39	22.54	0	11.54	11.52	11.89
			8	4	1	22.48	22.39	22.55	0	11.56	11.55	11.89
			8	7	1	22.46	22.43	22.53	0	11.53	11.54	11.91
			15	0	1	22.49	22.37	22.54	0	11.55	11.54	11.86
		16QAM	1	0	1	22.50	22.56	22.59	0	11.29	11.59	11.87
			1	8	1	22.35	22.59	22.53	0	11.41	11.75	11.89
			1	14	1	22.35	22.56	22.53	0	11.39	11.67	12.00
			8	0	2	21.51	21.41	21.40	0	11.56	11.60	11.88
			8	4	2	21.53	21.40	21.42	0	11.53	11.58	11.82
			8	7	2	21.52	21.41	21.45	0	11.56	11.58	11.82
			15	0	2	21.50	21.37	21.59	0	11.46	11.54	11.89
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)			Target MPR	Reduction. Avg Pwr (dBm)		
						1710.7 MHz	1732.5 MHz	1754.3 MHz		1710.7 MHz	1732.5 MHz	1754.3 MHz
LTE Band 4	1.4	QPSK	1	0	0	23.50	23.47	23.69	0	11.46	11.57	11.95
			1	3	0	23.49	23.43	23.71	0	11.47	11.54	11.93
			1	5	0	23.48	23.43	23.72	0	11.56	11.56	11.95
			3	0	0	23.46	23.37	23.64	0	11.50	11.50	11.93
			3	1	0	23.49	23.40	23.64	0	11.54	11.56	11.94
			3	3	0	23.46	23.41	23.65	0	11.58	11.57	11.89
			6	0	1	22.50	22.39	22.65	0	11.46	11.54	11.88
		16QAM	1	0	1	22.41	22.44	22.51	0	11.46	11.48	11.85
			1	3	1	22.41	22.47	22.63	0	11.44	11.33	11.80
			1	5	1	22.63	22.54	22.75	0	11.58	11.82	11.92
			3	0	1	22.34	22.45	22.66	0	11.46	11.61	11.94
			3	1	1	22.48	22.56	22.74	0	11.39	11.64	11.90
			3	3	1	22.50	22.37	22.70	0	11.58	11.65	11.94
			6	0	2	21.58	21.45	21.53	0	11.55	11.57	11.82

Note(s):

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

This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

LTE Band 5 Measured Results

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)			Target MPR	Reduction. Avg Pwr (dBm)		
						829 MHz	836.5 MHz	844 MHz		829 MHz	836.5 MHz	844 MHz
LTE Band 5	10	QPSK	1	0	0		23.90		0		18.84	
			1	25	0		23.83		0		18.81	
			1	49	0		23.81		0		18.78	
			25	0	1		22.80		0		18.77	
			25	12	1		22.79		0		18.76	
			25	25	1		22.79		0		18.73	
			50	0	1		22.80		0		18.76	
		16QAM	1	0	1		22.76		0		18.88	
			1	25	1		23.03		0		19.00	
			1	49	1		22.92		0		18.92	
			25	0	2		21.87		0		18.88	
			25	12	2		21.85		0		18.84	
			25	25	2		21.83		0		18.85	
			50	0	2		21.84		0		18.82	

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)			Target MPR	Reduction. Avg Pwr (dBm)		
						826.5 MHz	836.5 MHz	846.5 MHz		826.5 MHz	836.5 MHz	846.5 MHz
LTE Band 5	5	QPSK	1	0	0	23.93	23.87	23.17	0	18.83	18.78	18.11
			1	12	0	23.94	23.82	23.17	0	18.83	18.85	18.13
			1	24	0	23.94	23.82	23.15	0	18.84	18.80	18.14
			12	0	1	22.83	22.83	22.15	0	18.75	18.79	18.14
			12	6	1	22.81	22.81	22.11	0	18.73	18.74	18.13
			12	11	1	22.82	22.80	22.15	0	18.73	18.74	18.12
			25	0	1	22.81	22.80	22.18	0	18.75	18.75	18.11
		16QAM	1	0	1	22.66	22.81	22.13	0	18.82	18.95	18.21
			1	12	1	22.67	22.83	22.07	0	18.73	18.82	18.21
			1	24	1	22.74	22.93	22.05	0	18.80	18.85	18.05
			12	0	2	21.71	21.81	21.13	0	18.75	18.77	18.09
			12	6	2	21.68	21.75	21.12	0	18.72	18.72	18.12
			12	11	2	21.68	21.71	21.12	0	18.70	18.72	18.12
			25	0	2	21.87	21.83	21.16	0	18.81	18.77	18.11

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)			Target MPR	Reduction. Avg Pwr (dBm)		
						825.5 MHz	836.5 MHz	847.5 MHz		825.5 MHz	836.5 MHz	847.5 MHz
LTE Band 5	3	QPSK	1	0	0	23.91	23.93	23.28	0	18.84	18.83	18.24
			1	7	0	23.97	23.86	23.27	0	18.85	18.81	18.22
			1	14	0	23.88	23.87	23.23	0	18.83	18.76	18.16
			8	0	1	22.82	22.80	22.11	0	18.79	18.77	18.11
			8	4	1	22.83	22.81	22.11	0	18.82	18.78	18.10
			8	7	1	22.82	22.79	22.09	0	18.81	18.78	18.10
			15	0	1	22.85	22.79	22.10	0	18.79	18.76	18.08
		16QAM	1	0	1	22.73	23.01	21.95	0	18.84	19.00	18.20
			1	7	1	22.84	23.09	21.90	0	18.78	18.98	18.22
			1	14	1	22.73	23.06	21.99	0	18.86	18.95	18.16
			8	0	2	21.82	21.75	21.05	0	18.86	18.84	18.03
			8	4	2	21.84	21.72	21.00	0	18.86	18.85	18.03
			8	7	2	21.82	21.73	20.99	0	18.82	18.79	18.00
			15	0	2	21.89	21.73	21.12	0	18.72	18.73	18.09

This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

LTE Band 5 Measured Results (continued)

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)			Target MPR	Reduction. Avg Pwr (dBm)		
						824.7 MHz	836.5 MHz	848.3 MHz		824.7 MHz	836.5 MHz	848.3 MHz
LTE Band 5	1.4	QPSK	1	0	0	23.89	23.87	23.42	0	18.77	18.76	18.28
			1	2	0	23.89	23.87	23.44	0	18.75	18.78	18.25
			1	5	0	23.84	23.83	23.41	0	18.76	18.75	18.21
			3	0	0	23.88	23.82	23.38	0	18.78	18.73	18.24
			3	1	0	23.85	23.85	23.35	0	18.79	18.76	18.24
			3	2	0	23.87	23.83	23.39	0	18.77	18.77	18.25
			6	0	1	22.85	22.84	22.32	0	18.79	18.78	18.25
		16QAM	1	0	1	22.84	22.82	22.30	0	18.81	18.94	18.22
			1	2	1	22.76	22.85	22.34	0	18.91	19.00	18.42
			1	5	1	22.77	22.87	22.31	0	18.93	18.78	18.34
			3	0	1	22.76	23.00	22.35	0	18.84	18.74	18.26
			3	1	1	22.83	22.91	22.37	0	18.88	18.74	18.29
			3	2	1	22.78	22.86	22.45	0	18.83	18.77	18.28
			6	0	2	21.90	21.85	21.18	0	18.83	18.77	18.15

Note(s):

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

This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

LTE Band 7 Measured Results

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)			Target MPR	Reduction. Avg Pwr (dBm)		
						2510 MHz	2535 MHz	2560 MHz		2510 MHz	2535 MHz	2560 MHz
LTE Band 7	20	QPSK	1	0	0	22.17	22.61	22.35	0	14.18	14.60	14.44
			1	49	0	22.25	22.55	22.26	0	14.21	14.50	14.30
			1	99	0	22.23	22.48	22.30	0	14.24	14.41	14.29
			50	0	1	21.17	21.48	21.32	0	14.22	14.57	14.36
			50	24	1	21.18	21.45	21.30	0	14.23	14.50	14.31
			50	50	1	21.21	21.42	21.29	0	14.23	14.47	14.30
			100	0	1	21.19	21.47	21.30	0	14.20	14.49	14.33
		16QAM	1	0	1	21.12	21.65	21.38	0	13.89	14.10	13.92
			1	49	1	21.19	21.60	21.24	0	14.13	14.00	14.32
			1	99	1	21.18	21.39	21.22	0	14.15	14.41	14.23
			50	0	2	20.15	20.47	20.24	0	14.18	14.48	14.35
			50	24	2	20.18	20.44	20.21	0	14.21	14.44	14.28
			50	50	2	20.16	20.36	20.23	0	14.21	14.40	14.26
			100	0	2	20.23	20.49	20.29	0	14.24	14.55	14.32

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)			Target MPR	Reduction. Avg Pwr (dBm)		
						2507.5 MHz	2535 MHz	2562.5 MHz		2507.5 MHz	2535 MHz	2562.5 MHz
LTE Band 7	15	QPSK	1	0	0	22.19	22.59	22.35	0	14.17	14.63	14.41
			1	37	0	22.26	22.51	22.31	0	14.23	14.59	14.39
			1	74	0	22.27	22.40	22.28	0	14.25	14.45	14.36
			36	0	1	21.18	21.48	21.25	0	14.18	14.56	14.34
			36	20	1	21.20	21.48	21.26	0	14.23	14.53	14.31
			36	39	1	21.21	21.44	21.27	0	14.25	14.49	14.30
			75	0	1	21.19	21.47	21.28	0	14.24	14.50	14.31
		16QAM	1	0	1	21.09	21.75	21.29	0	14.08	14.65	14.39
			1	37	1	21.12	21.62	21.36	0	14.28	14.58	14.56
			1	74	1	21.26	21.53	21.41	0	14.11	14.60	14.36
			36	0	2	20.15	20.39	20.28	0	14.19	14.51	14.37
			36	20	2	20.15	20.37	20.26	0	14.19	14.45	14.33
			36	39	2	20.20	20.33	20.23	0	14.24	14.44	14.35
			75	0	2	20.15	20.40	20.23	0	14.20	14.52	14.30

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)			Target MPR	Reduction. Avg Pwr (dBm)		
						2505 MHz	2535 MHz	2565 MHz		2505 MHz	2535 MHz	2565 MHz
LTE Band 7	10	QPSK	1	0	0	22.18	22.61	22.34	0	14.23	14.70	14.37
			1	25	0	22.23	22.54	22.35	0	14.19	14.61	14.37
			1	49	0	22.28	22.52	22.33	0	14.33	14.61	14.33
			25	0	1	21.16	21.50	21.27	0	14.21	14.57	14.29
			25	12	1	21.17	21.48	21.27	0	14.22	14.50	14.29
			25	25	1	21.17	21.46	21.25	0	14.26	14.51	14.27
			50	0	1	21.18	21.49	21.26	0	14.24	14.55	14.32
		16QAM	1	0	1	21.07	21.51	21.21	0	14.05	14.46	14.31
			1	25	1	21.16	21.69	21.38	0	14.01	14.47	14.44
			1	49	1	21.14	21.66	21.23	0	14.27	14.58	14.31
			25	0	2	20.11	20.52	20.24	0	14.23	14.60	14.35
			25	12	2	20.13	20.49	20.24	0	14.25	14.58	14.34
			25	25	2	20.17	20.50	20.25	0	14.24	14.57	14.33
			50	0	2	20.12	20.48	20.18	0	14.23	14.54	14.28

This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

LTE Band 7 Measured Results (continued)

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)			Target MPR	Reduction. Avg Pwr (dBm)		
						2502.5 MHz	2535 MHz	2567.5 MHz		2502.5 MHz	2535 MHz	2567.5 MHz
LTE Band 7	5	QPSK	1	0	0	22.28	22.57	22.32	0	14.27	14.61	14.45
			1	12	0	22.24	22.52	22.30	0	14.24	14.54	14.43
			1	24	0	22.33	22.55	22.29	0	14.25	14.52	14.47
			12	0	1	21.13	21.52	21.28	0	14.20	14.57	14.34
			12	7	1	21.17	21.51	21.28	0	14.20	14.54	14.35
			12	13	1	21.20	21.48	21.28	0	14.22	14.54	14.34
			25	0	1	21.16	21.52	21.26	0	14.23	14.54	14.35
		16QAM	1	0	1	20.98	21.65	21.19	0	14.26	14.50	14.22
			1	12	1	21.00	21.69	21.27	0	14.23	14.47	14.30
			1	24	1	21.03	21.72	21.39	0	14.19	14.49	14.13
			12	0	2	20.12	20.49	20.23	0	14.22	14.52	14.27
			12	7	2	20.15	20.46	20.21	0	14.18	14.52	14.25
			12	13	2	20.13	20.46	20.24	0	14.18	14.51	14.30
			25	0	2	20.19	20.49	20.27	0	14.19	14.61	14.43

This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

LTE Band 13 Measured Results

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)	Target MPR	Reduction. Avg Pwr (dBm)
						782 MHz		782 MHz
LTE Band 13	10	QPSK	1	0	0	23.69	0	17.64
			1	25	0	23.63	0	17.68
			1	49	0	23.60	0	17.66
			25	0	1	22.55	0	17.62
			25	12	1	22.54	0	17.58
			25	25	1	22.51	0	17.56
			50	0	1	22.53	0	17.59
		16QAM	1	0	1	22.67	0	17.63
			1	25	1	22.43	0	17.76
			1	49	1	22.48	0	17.65
			25	0	2	21.62	0	17.67
			25	12	2	21.61	0	17.62
			25	25	2	21.59	0	17.63
			50	0	2	21.57	0	17.60
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)	Target MPR	Reduction. Avg Pwr (dBm)
						782 MHz		782 MHz
LTE Band 13	5	QPSK	1	0	0	23.59	0	17.65
			1	12	0	23.55	0	17.60
			1	24	0	23.56	0	17.61
			12	0	1	22.56	0	17.61
			12	6	1	22.55	0	17.61
			12	11	1	22.52	0	17.59
			25	0	1	22.51	0	17.58
		16QAM	1	0	1	22.68	0	17.59
			1	12	1	22.64	0	17.54
			1	24	1	22.58	0	17.60
			12	0	2	21.51	0	17.57
			12	6	2	21.51	0	17.57
			12	11	2	21.54	0	17.57
			25	0	2	21.58	0	17.59

Note(s):

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

This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

9.2.1 LTE Rel. 10 Carrier Aggregation

LTE Release 10 Carrier Aggregation

The following power measurements were performed with a single carrier uplink; CA for this particular project only supports one(1) uplink and two (2) downlinks.

1) Max power results

Type	LTE CA combinations			PCC (UL)					SCC (DL)			LTE Rel 8 Tx. Power [dBm]	LTE Rel 10 Tx. Power [dBm]	Delta
	PCC	+	SCC	Mode	BW (MHz)	Channel	Freq. (MHz)	RB/Offset	BW (MHz)	Channel	Freq. (MHz)			
Inter Non-Contiguous	4A	+	13A(1)	QPSK	10	20350	1750.0	1/0	10	5230	751.0	23.65	23.84	0.19
	2A	+	13A(1)	QPSK	5	19175	1907.5	1/12	10	5230	751.0	23.34	23.01	-0.33
	13A	+	4A(1)	QPSK	10	23230	782.0	1/0	10	2175	2132.5	23.69	23.67	-0.02
	13A	+	2A(1)	QPSK	10	23230	782.0	1/0	10	900	1960.0	23.69	23.66	-0.03

2) Reduction power results

Type	LTE CA combinations			PCC (UL)					SCC (DL)			LTE Rel 8 Tx. Power [dBm]	LTE Rel 10 Tx. Power [dBm]	Delta
	PCC	+	SCC	Mode	BW (MHz)	Channel	Freq. (MHz)	RB/Offset	BW (MHz)	Channel	Freq. (MHz)			
Inter Non-Contiguous	4A	+	13A(1)	QPSK	10	20350	1750.0	1/49	10	5230	751.0	12.00	11.78	-0.22
	2A	+	13A(1)	16QAM	10	19150	1905.0	1/49	10	5230	751.0	11.27	11.07	-0.20
	13A	+	4A(1)	QPSK	10	23230	782.0	1/25	10	2175	2132.5	17.68	17.69	0.01
	13A	+	2A(1)	QPSK	10	23230	782.0	1/25	10	900	1960.0	17.68	17.71	0.03

Note(s):

1. Per KDB 941225 D05A LTE Rel. 10 KDB inquiry Sheet: SAR is excluded for Carrier Aggregation when measured power doesn't exceed LTE Release 8 by more than a 1/4 dBm.
2. Maximum output power for the uplink with downlink carrier aggregation active may be measured using the highest maximum output power configuration for uplink with downlink carrier aggregation inactive measured among the channel bandwidth, modulation and RB combinations in each frequency band.

This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

9.3. Wi-Fi 2.4 GHz (DTS Band)

Measured Results

Antenna	Mode	Data Rate	Ch #	Freq. (MHz)	Max. Avg Pwr (dBm)			Reduction Avg Pwr (dBm)		
					Avg Pwr (dBm)	Max Output Power (dBm)	SAR Test (Yes/No)	Avg Pwr (dBm)	Max Output Power (dBm)	SAR Test (Yes/No)
Main	802.11b	1 Mbps	1	2412	15.92	16.5	Yes	11.95	12.5	Yes
			6	2437	15.84			11.76		
			11	2462	15.93			11.96		
	802.11g	6 Mbps	1	2412	Not Required	14.5	No	11.55	12.5	No
			6	2437				11.83		
			11	2462		12.5		12.18		
	802.11n	6.5 Mbps	1	2412	Not Required	12.5	No	11.40	12.5	No
			6	2437				11.86		
			11	2462		11.5		11.09	11.5	

Note(s):

1. Output power and SAR is not required for 802.11 g/n HT 20 channels 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.

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

Measured Results

Antenna	Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Max. Avg Pwr (dBm)			Reduction. Avg Pwr (dBm)		
						Avg Pwr (dBm)	Max Output Power (dBm)	SAR Test (Yes/No)	Avg Pwr (dBm)	Max Output Power (dBm)	SAR Test (Yes/No)
Main	5.3 (U-NII 2A)	802.11a	6 Mbps	52	5260	12.48	13.5	Yes	11.57	12.0	Yes
				56	5280	12.40			11.89		
				60	5300	12.53			11.81		
				64	5320	12.66			11.88		
		802.11n (HT20)	6.5 Mbps	52	5260	Not Required	12.0	No	11.94	12.0	No
				56	5280				11.85		
				60	5300				11.89		
				64	5320				11.99		
		802.11n (HT40)	13.5 Mbps	54	5270	Not Required	11.5	No	Not Required	11.5	No
				62	5310						
	5.5 (U-NII 2C)	802.11a	6 Mbps	100	5500	12.50	13.5	Yes	11.30	12.0	Yes
				120	5600	12.66			11.21		
				124	5620	12.71			11.78		
				144	5720	12.82			11.05		
		802.11n (HT20)	6.5 Mbps	100	5500	Not Required	12.0	No	11.82	12.0	No
				120	5600				11.78		
				124	5620				11.94		
				144	5720				11.96		
		802.11n (HT40)	13.5 Mbps	102	5510	Not Required	11.5	No	Not Required	11.5	No
				118	5590						
				126	5630						
				142	5710						
	5.8 (U-NII 3)	802.11a	6 Mbps	149	5745	12.92	13.5	Yes	11.12	12.0	Yes
				157	5785	12.91			11.84		
				165	5825	12.74			11.78		
		802.11n (HT20)	6.5 Mbps	149	5745	Not Required	12.0	No	11.28	12.0	No
				157	5785				11.95		
				165	5825				11.99		
		802.11n (HT40)	13.5 Mbps	151	5755	Not Required	11.5	No	Not Required	11.5	No
				159	5795						

Note(s):

1. 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. Additional output power
2. When the same transmission mode configurations have the same maximum output power on the same channel for the 802.11 a/g/n/ac modes, the channel in the lower order/sequence 802.11 mode (i.e. a, g, n then ac) is selected.
3. 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.

This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

9.5. Bluetooth

Maximum tune-up tolerance limit is 8.0 dBm from the rated nominal maximum output power. This power level qualifies for exclusion of SAR testing.

10. Measured and Reported (Scaled) SAR Results

SAR Test Reduction criteria are as follows:

KDB 447498 D01 General RF Exposure Guidance:
Testing of other required channels within the operating mode of a frequency band is not required when the reported 1-g or 10-g SAR for the mid-band or highest output power channel is:

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

KDB 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 ≤ ¼ 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 must be measured with the maximum TTI(transmit time interval) supported by the device in each LTE configuration.
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.

This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

KDB 248227 D01 SAR measurement for 802.11 v02r02:

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*.

This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

10.1. W-CDMA Band II

RF Exposure Conditins	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	
Standalone	Rel 99 RMC	ON	0	Rear	9400	1880.0	12.00	10.92	0.508	0.651	1
				Edge 1	9400	1880.0	12.00	10.92	0.150	0.192	
				Edge 4	9400	1880.0	12.00	10.92	0.096	0.123	
Standalone	Rel 99 RMC	OFF	21	Rear	9538	1907.6	23.50	22.61	0.389	0.478	
			14	Edge 1	9538	1907.6	23.50	22.61	0.480	0.589	
			9	Corner	9538	1907.6	23.50	22.61	0.390	0.479	
			9	Edge 4	9538	1907.6	23.50	22.61	0.294	0.361	

10.2. W-CDMA Band V

RF Exposure Conditins	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	
Standalone	Rel 99 RMC	ON	0	Rear	4183	836.6	18.50	17.74	0.448	0.533	2
				Edge 1	4183	836.6	18.50	17.74	0.264	0.314	
				Corner	4183	836.6	18.50	17.74	0.121	0.144	
				Edge 4	4183	836.6	18.50	17.74	0.306	0.364	
Standalone	Rel 99 RMC	OFF	21	Rear	4183	836.6	23.50	22.95	0.288	0.327	
			14	Edge 1	4183	836.6	23.50	22.95	0.233	0.264	
			9	Corner	4183	836.6	23.50	22.95	0.077	0.087	
			9	Edge 4	4183	836.6	23.50	22.95	0.224	0.254	

10.3. LTE Band 2 (20 MHz Bandwidth)

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	
Standalone	QPSK	On	0	Rear	19100	1900.0	1	49	11.50	10.87	0.518	0.599	
							50	50	11.50	10.87	0.553	0.640	3
				Edge 1	19100	1900.0	1	49	11.50	10.87	0.150	0.173	
							50	50	11.50	10.87	0.150	0.174	
				Edge 4	19100	1900.0	1	49	11.50	10.87	0.102	0.118	
							50	50	11.50	10.87	0.102	0.118	
Standalone	QPSK	OFF	21	Rear	19100	1900.0	1	49	23.50	23.14	0.439	0.477	
							50	50	22.50	22.25	0.353	0.374	
			14	Edge 1	19100	1900.0	1	49	23.50	23.14	0.560	0.608	
							50	50	22.50	22.25	0.440	0.466	
			9	Corner	19100	1900.0	1	49	23.50	23.14	0.486	0.528	
							50	50	22.50	22.25	0.393	0.416	
			9	Edge 4	19100	1900.0	1	49	23.50	23.14	0.408	0.443	
							50	50	22.50	22.25	0.302	0.320	

This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

10.4. LTE Band 4 (20 MHz Bandwidth)

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	
Standalone	QPSK	On	0	Rear	20175	1732.5	1	99	12.00	11.67	0.563	0.607	
							50	24	12.00	11.58	0.557	0.613	
				Edge 1	20175	1732.5	1	99	12.00	11.67	0.204	0.220	
							50	24	12.00	11.58	0.214	0.236	
				Edge 4	20175	1732.5	1	99	12.00	11.67	0.149	0.161	
							50	24	12.00	11.58	0.158	0.174	
Standalone	QPSK	OFF	21	Rear	20175	1732.5	1	99	24.00	23.44	0.498	0.566	
							50	50	23.00	22.40	0.397	0.456	
			14	Edge 1	20175	1732.5	1	99	24.00	23.44	0.629	0.715	4
							50	50	23.00	22.40	0.509	0.584	
			9	Corner	20175	1732.5	1	99	24.00	23.44	0.613	0.697	
							50	50	23.00	22.40	0.493	0.566	
			9	Edge 4	20175	1732.5	1	99	24.00	23.44	0.609	0.692	
							50	50	23.00	22.40	0.500	0.574	

10.5. LTE Band 5 (10MHz Bandwidth)

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	
Standalone	QPSK	On	0	Rear	20525	836.5	1	0	19.00	18.84	0.584	0.606	5
							25	0	19.00	18.77	0.568	0.599	
				Edge 1	20525	836.5	1	0	19.00	18.84	0.360	0.374	
							25	0	19.00	18.77	0.357	0.376	
				Corner	20525	836.5	1	0	19.00	18.84	0.143	0.148	
							25	0	19.00	18.77	0.142	0.150	
				Edge 4	20525	836.5	1	0	19.00	18.84	0.385	0.400	
							25	0	19.00	18.77	0.382	0.403	
Standalone	QPSK	OFF	21	Rear	20525	836.5	1	0	24.50	23.90	0.413	0.474	
							25	0	23.50	22.80	0.326	0.383	
			14	Edge 1	20525	836.5	1	0	24.50	23.90	0.322	0.369	
							25	0	23.50	22.80	0.227	0.266	
			9	Corner	20525	836.5	1	0	24.50	23.90	0.096	0.110	
							25	0	23.50	22.80	0.075	0.088	
			9	Edge 4	20525	836.5	1	0	24.50	23.90	0.254	0.291	
							25	0	23.50	22.80	0.200	0.235	

This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

10.6. LTE Band 7 (20MHz Bandwidth)

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	
Standalone	QPSK	On	0	Rear	21100	2535.0	1	0	15.00	14.60	0.574	0.630	
							50	0	15.00	14.57	0.577	0.638	6
				Edge 1	21100	2535.0	1	0	15.00	14.60	0.151	0.166	
							50	0	15.00	14.57	0.151	0.167	
				Corner	21100	2535.0	1	0	15.00	14.60	0.058	0.064	
							50	0	15.00	14.57	0.057	0.063	
				Edge 4	21100	2535.0	1	0	15.00	14.60	0.076	0.083	
							50	0	15.00	14.57	0.074	0.081	
Standalone	QPSK	OFF	21	Rear	21100	2535.0	1	0	23.00	22.61	0.176	0.193	
							50	0	22.00	21.48	0.137	0.154	
			14	Edge 1	21100	2535.0	1	0	23.00	22.61	0.233	0.255	
							50	0	22.00	21.48	0.183	0.206	
			9	Corner	21100	2535.0	1	0	23.00	22.61	0.140	0.153	
							50	0	22.00	21.48	0.111	0.125	
			9	Edge 4	21100	2535.0	1	0	23.00	22.61	0.161	0.176	
							50	0	22.00	21.48	0.125	0.141	

10.7. LTE Band 13 (10MHz Bandwidth)

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	
Standalone	QPSK	On	0	Rear	23230	782.0	1	25	18.00	17.68	0.511	0.550	
							25	0	18.00	17.62	0.515	0.562	7
				Edge 1	23230	782.0	1	25	18.00	17.68	0.311	0.335	
							25	0	18.00	17.62	0.312	0.340	
				Corner	23230	782.0	1	25	18.00	17.68	0.094	0.101	
							25	0	18.00	17.62	0.092	0.100	
				Edge 4	23230	782.0	1	25	18.00	17.68	0.209	0.225	
							25	0	18.00	17.62	0.204	0.223	
Standalone	QPSK	OFF	21	Rear	23230	782.0	1	0	24.50	23.69	0.317	0.382	
							25	0	23.50	22.55	0.269	0.334	
			14	Edge 1	23230	782.0	1	0	24.50	23.69	0.321	0.386	
							25	0	23.50	22.55	0.249	0.310	
			9	Corner	23230	782.0	1	0	24.50	23.69	0.055	0.066	
							25	0	23.50	22.55	0.048	0.060	
			9	Edge 4	23230	782.0	1	0	24.50	23.69	0.145	0.175	
							25	0	23.50	22.55	0.112	0.139	

This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

10.8. Wi-Fi (DTS Band)

Mode	Mode	Pwr. Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Area Scan Max. SAR (W/kg)	Power (dBm)		1-g SAR (W/kg)		Note	Plot No.
								Tune-up limit	Meas.	Meas.	Scaled		
Standalone	802.11b 1 Mbps	On	0	Rear	1	2412.0	1.106	12.50	11.95	0.738	0.838	3	
					11	2462.0	1.049	12.50	11.96	0.794	0.899		
		Off	6	Rear	11	2462.0	0.835	16.50	15.93	0.619	0.706	2	
			0	Edge 1	1	2412.0	0.769	16.50	15.92	0.720	0.823	3	
					11	2462.0	0.905	16.50	15.93	0.819	0.934		8

Note(s):

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

10.9. Wi-Fi (U-NII Band)

Mode	Frequency Band	Mode	Pwr. Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Area Scan Max. SAR (W/kg)	Power (dBm)		1-g SAR (W/kg)		Note	Plot No.
									Tune-up limit	Meas.	Meas.	Scaled		
Standalone	5.3 GHz U-NII 2A	802.11a 6 Mbps	On	0	Rear	56	5280.0	1.099	12.00	11.89	0.596	0.611		
			Off	6	Rear	64	5320.0	0.413	13.50	12.66	0.191	0.232	2	
				0	Edge 1	60	5300.0	1.488	13.50	12.53	0.703	0.879	3	9
						64	5320.0	1.494	13.50	12.66	0.710	0.862		
Mode	Frequency Band	Mode	Pwr. Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Area Scan Max. SAR (W/kg)	Power (dBm)		1-g SAR (W/kg)		Note	Plot No.
									Tune-up limit	Meas.	Meas.	Scaled		
Standalone	5.5 GHz U-NII 2C	802.11a 6 Mbps	On	0	Rear	124	5620.0	1.677	12.00	11.78	0.704	0.741		10
			Off	6	Rear	144	5720.0	0.413	13.50	12.82	0.211	0.247	2	
				0	Edge 1	144	5720.0	1.177	13.50	12.82	0.504	0.589		
Mode	Frequency Band	Mode	Pwr. Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Area Scan Max. SAR (W/kg)	Power (dBm)		1-g SAR (W/kg)		Note	Plot No.
									Tune-up limit	Meas.	Meas.	Scaled		
Standalone	5.8 GHz U-NII-3	802.11a 6 Mbps	On	0	Rear	157	5785.0	1.517	12.00	11.84	0.655	0.680		
			Off	6	Rear	149	5745.0	0.492	13.50	12.92	0.257	0.294	2	
				0	Edge 1	149	5745.0	1.422	13.50	12.92	0.612	0.699		11

Note(s):

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

10.10. Bluetooth

Maximum tune-up tolerance limit is 8.0 dBm from the rated nominal maximum output power. This power level qualifies for exclusion of SAR testing. SAR test exclusion is mentioned at Sec.7.1.and Estimated SAR for simultaneous is mentioned at Sec.12.

This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

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

Frequency Band (MHz)	Air Interface	RF Exposure Conditions	Test Position	Repeated SAR (Yes/No)	Highest Measured SAR (W/kg)	First Repeated	
						Measured SAR (W/kg)	Largest to Smallest SAR Ratio
750	LTE Band 13	Standalone	Rear	No	0.515	N/A	N/A
850	WCDMA Band V	Standalone	Rear	No	0.448	N/A	N/A
	LTE Band 5	Standalone	Rear	No	0.584	N/A	N/A
1750	LTE Band 4	Standalone	Edge 1	No	0.629	N/A	N/A
1900	WCDMA Band II	Standalone	Rear	No	0.508	N/A	N/A
	LTE Band 2	Standalone	Edge 1	No	0.560	N/A	N/A
2400	Wi-Fi 802.11b/g/n	Standalone	Edge 1	Yes	0.819	0.809	1.01
2600	LTE Band 7	Standalone	Rear	No	0.577	N/A	N/A
5300	Wi-Fi 802.11a/n/ac	Standalone	Edge 1	No	0.710	N/A	N/A
5500	Wi-Fi 802.11a/n/ac	Standalone	Rear	No	0.704	N/A	N/A
5800	Wi-Fi 802.11a/n/ac	Standalone	Rear	No	0.655	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.

This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

12. Simultaneous Transmission SAR Analysis

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

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

Where:

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

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

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

In order for a pair of simultaneous transmitting antennas with the sum of 1-g SAR > 1.6 W/kg to qualify for exemption from Simultaneous Transmission SAR measurements, it has to satisfy the condition of:

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

Simultaneous Transmission Condition

RF Exposure Condition	Item	Capable Transmit Configurations		
Standalone	1	W-CDMA	+	DTS
	2	W-CDMA	+	U-NII
	3	W-CDMA	+	BT
	4	LTE	+	DTS
	5	LTE	+	U-NII
	6	LTE	+	BT

Notes:

1. DTS(Ch.1 ~ Ch.11) and UNII(Ch.149) support Mobile Hotspot
2. DTS(Ch.1 ~ Ch.11) and U-NII(Ch.36 ~ Ch.48, Ch.149 ~ Ch.165) support Wi-Fi Direct.
3. W-CDMA and LTE support Hotspot.
4. VoIP is supported in W-CDMA and LTE.
5. DTS Radio cannot transmit simultaneously with Bluetooth Radio.
6. U-NII Radio cannot transmit simultaneously with Bluetooth Radio.
7. U-NII Radio cannot transmit simultaneously with DTS Radio.
8. This Device supports Bluetooth tethering function.

This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

Estimated SAR for Simultaneous Transmission SAR Analysis

Considerations for SAR estimation

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

Estimated SAR for WWAN

Antenna	Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)						Estimated 1-g SAR Value (W/kg)					
			dBm	mW	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Corner	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Corner
Full Power, Proximity Sensor Off																
Cellular	W-CDMA 5	846.6	23.50	224	1.1	3	88.5	178.5	4	9.2	-MEASURE-	-MEASURE-	0.400	0.400	-MEASURE-	-MEASURE-
Cellular	W-CDMA 2	1907.6	23.50	224	1.1	3	88.5	178.5	4	9.2	-MEASURE-	-MEASURE-	0.400	0.400	-MEASURE-	-MEASURE-
Cellular	LTE Band 2	1900	23.50	224	1.1	3	88.5	178.5	4	9.2	-MEASURE-	-MEASURE-	0.400	0.400	-MEASURE-	-MEASURE-
Cellular	LTE Band 4	1754.3	24.00	251	1.1	3	88.5	178.5	4	9.2	-MEASURE-	-MEASURE-	0.400	0.400	-MEASURE-	-MEASURE-
Cellular	LTE Band 5	844	24.50	282	1.1	3	88.5	178.5	4	9.2	-MEASURE-	-MEASURE-	0.400	0.400	-MEASURE-	-MEASURE-
Cellular	LTE Band 7	2560	23.00	200	1.1	3	88.5	178.5	4	9.2	-MEASURE-	-MEASURE-	0.400	0.400	-MEASURE-	-MEASURE-
Cellular	LTE Band 13	782	24.00	251	1.1	3	88.5	178.5	4	9.2	-MEASURE-	-MEASURE-	0.400	0.400	-MEASURE-	-MEASURE-
Power Back-off, Proximity Sensor On																
Cellular	W-CDMA 5	846.6	18.50	71	1.1	3			4	9.2	-MEASURE-	-MEASURE-			-MEASURE-	-MEASURE-
Cellular	W-CDMA 2	1907.6	12.00	16	1.1	3			4	9.2	-MEASURE-	-MEASURE-			-MEASURE-	0.327
Cellular	LTE Band 2	1900	11.50	14	1.1	3			4	9.2	-MEASURE-	-MEASURE-			-MEASURE-	0.286
Cellular	LTE Band 4	1754.3	12.00	16	1.1	3			4	9.2	-MEASURE-	-MEASURE-			-MEASURE-	0.314
Cellular	LTE Band 5	844	19.00	79	1.1	3			4	9.2	-MEASURE-	-MEASURE-			-MEASURE-	-MEASURE-
Cellular	LTE Band 7	2560	15.00	32	1.1	3			4	9.2	-MEASURE-	-MEASURE-			-MEASURE-	-MEASURE-
Cellular	LTE Band 13	782	18.00	63	1.1	3			4	9.2	-MEASURE-	-MEASURE-			-MEASURE-	-MEASURE-

Estimated SAR for WLAN

Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)						Estimated 1-g SAR Value (W/kg)					
		dBm	mW	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front
Full power, Proximity sensor Off															
Wi-Fi 2.4 GHz	2462	16.50	45	1.8	4	54.5	201.5	60.5		-MEASURE-	-MEASURE-	0.400	0.400	0.400	
Wi-Fi 5.3 GHz	5320	13.50	22	1.8	4	54.5	201.5	60.5		-MEASURE-	-MEASURE-	0.400	0.400	0.400	
Wi-Fi 5.5 GHz	5720	13.50	22	1.8	4	54.5	201.5	60.5		-MEASURE-	-MEASURE-	0.400	0.400	0.400	
Wi-Fi 5.8 GHz	5825	13.50	22	1.8	4	54.5	201.5	60.5		-MEASURE-	-MEASURE-	0.400	0.400	0.400	
Bluetooth	2480	8.00	6	1.8	4	54.5	201.5	60.5		0.252	0.252	0.400	0.400	0.400	
Power Back-off, Proximity sensor On															
Wi-Fi 2.4 GHz	2462	12.50	18	1.8						-MEASURE-					
Wi-Fi 5.3 GHz	5320	12.00	16	1.8						-MEASURE-					
Wi-Fi 5.5 GHz	5720	12.00	16	1.8						-MEASURE-					
Wi-Fi 5.8 GHz	5825	12.00	16	1.8						-MEASURE-					

This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

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

Test Position	Standalone SAR (W/kg)				∑ 1-g SAR (W/kg)		
	WWAN ①	DTS ②	UNII ③	BT ④	WWAN + DTS ① + ②	WWAN + UNII ① + ③	WWAN + BT ① + ④
Rear	0.651	0.899	0.741	0.252	1.550	1.392	0.903
Edge 1	0.589	0.934	0.879	0.252	1.523	1.468	0.841
Edge 2	0.400	0.400	0.400	0.400	0.800	0.800	0.800
Edge 3	0.400	0.400	0.400	0.400	0.800	0.800	0.800
Edge 4	0.361	0.400	0.400	0.400	0.761	0.761	0.761
Corner	0.479	0.400	0.400	0.400	0.879	0.879	0.879

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

Test Position	Standalone SAR (W/kg)				∑ 1-g SAR (W/kg)		
	WWAN ①	DTS ②	UNII ③	BT ④	WWAN + DTS ① + ②	WWAN + UNII ① + ③	WWAN + BT ① + ④
Rear	0.533	0.899	0.741	0.252	1.432	1.274	0.785
Edge 1	0.314	0.934	0.879	0.252	1.248	1.193	0.566
Edge 2	0.400	0.400	0.400	0.400	0.800	0.800	0.800
Edge 3	0.400	0.400	0.400	0.400	0.800	0.800	0.800
Edge 4	0.364	0.400	0.400	0.400	0.764	0.764	0.764
Corner	0.144	0.400	0.400	0.400	0.544	0.544	0.544

12.3. Sum of the SAR for LTE Band 2 & Wi-Fi & BT

Test Position	Standalone SAR (W/kg)				∑ 1-g SAR (W/kg)		
	WWAN ①	DTS ②	UNII ③	BT ④	WWAN + DTS ① + ②	WWAN + UNII ① + ③	WWAN + BT ① + ④
Rear	0.640	0.899	0.741	0.252	1.539	1.381	0.892
Edge 1	0.608	0.934	0.879	0.252	1.542	1.487	0.860
Edge 2	0.400	0.400	0.400	0.400	0.800	0.800	0.800
Edge 3	0.400	0.400	0.400	0.400	0.800	0.800	0.800
Edge 4	0.443	0.400	0.400	0.400	0.843	0.843	0.843
Corner	0.528	0.400	0.400	0.400	0.928	0.928	0.928

This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

12.4. Sum of the SAR for LTE Band 4 & Wi-Fi & BT

Test Position	Standalone SAR (W/kg)				∑ 1-g SAR (W/kg)		
	WWAN ①	DTS ②	UNII ③	BT ④	WWAN + DTS ① + ②	WWAN + UNII ① + ③	WWAN + BT ① + ④
Rear	0.613	0.899	0.741	0.252	1.512	1.354	0.865
Edge 1	0.715	0.934	0.879	0.252	1.649	1.594	0.967
Edge 2	0.400	0.400	0.400	0.400	0.800	0.800	0.800
Edge 3	0.400	0.400	0.400	0.400	0.800	0.800	0.800
Edge 4	0.692	0.400	0.400	0.400	1.092	1.092	1.092
Corner	0.697	0.400	0.400	0.400	1.097	1.097	1.097

SAR to Peak Location Separation Ratio (SPLSR)

Test Position	Standalone SAR (W/kg)		∑ 1-g SAR (W/kg)		Calculated distance (mm)	SPLSR (≤ 0.04)	Volume Scan (Yes/ No)	Figure
	① WWAN	② DTS						
Edge 1	0.715	0.934	① + ②	1.649	53.7	0.04	No	1

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

Test Position	Standalone SAR (W/kg)				∑ 1-g SAR (W/kg)		
	WWAN ①	DTS ②	UNII ③	BT ④	WWAN + DTS ① + ②	WWAN + UNII ① + ③	WWAN + BT ① + ④
Rear	0.606	0.899	0.741	0.252	1.505	1.347	0.858
Edge 1	0.376	0.934	0.879	0.252	1.310	1.255	0.628
Edge 2	0.400	0.400	0.400	0.400	0.800	0.800	0.800
Edge 3	0.400	0.400	0.400	0.400	0.800	0.800	0.800
Edge 4	0.403	0.400	0.400	0.400	0.803	0.803	0.803
Corner	0.150	0.400	0.400	0.400	0.550	0.550	0.550

12.6. Sum of the SAR for LTE Band 7 & Wi-Fi & BT

Test Position	Standalone SAR (W/kg)				∑ 1-g SAR (W/kg)		
	WWAN ①	DTS ②	UNII ③	BT ④	WWAN + DTS ① + ②	WWAN + UNII ① + ③	WWAN + BT ① + ④
Rear	0.638	0.899	0.741	0.252	1.537	1.379	0.890
Edge 1	0.255	0.934	0.879	0.252	1.189	1.134	0.507
Edge 2	0.400	0.400	0.400	0.400	0.800	0.800	0.800
Edge 3	0.400	0.400	0.400	0.400	0.800	0.800	0.800
Edge 4	0.176	0.400	0.400	0.400	0.576	0.576	0.576
Corner	0.153	0.400	0.400	0.400	0.553	0.553	0.553

This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

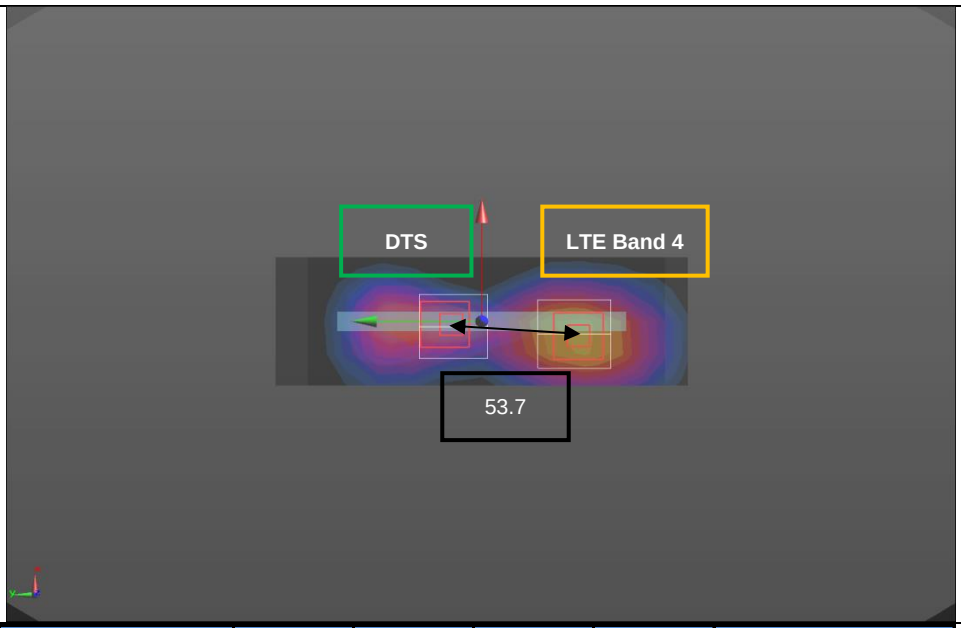
12.7. Sum of the SAR for LTE Band 13 & Wi-Fi & BT

Test Position	Standalone SAR (W/kg)				∑ 1-g SAR (W/kg)		
	WWAN ①	DTS ②	UNII ③	BT ④	WWAN + DTS ① + ②	WWAN + UNII ① + ③	WWAN + BT ① + ④
Rear	0.562	0.899	0.741	0.252	1.461	1.303	0.814
Edge 1	0.386	0.934	0.879	0.252	1.320	1.265	0.638
Edge 2	0.400	0.400	0.400	0.400	0.800	0.800	0.800
Edge 3	0.400	0.400	0.400	0.400	0.800	0.800	0.800
Edge 4	0.225	0.400	0.400	0.400	0.625	0.625	0.625
Corner	0.101	0.400	0.400	0.400	0.501	0.501	0.501

Conclusion:

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

Figure (1)



Mode		SAR W/kg	X m	Y m	Z m	d: Calculated distance (mm)	
LTE Band 4	①	0.715	-0.0014	0.0114	-0.0027	① + ②	53.7
DTS	②	0.934	-0.0060	-0.0421	-0.0029		

The Peak Location Separation Distance is computed by using the SQRT((X1-X2)^2+(Y1-Y2)^2+(Z1-Z2)^2)

This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.

Appendixes

Refer to separated files for the following appendixes.

4788103295-S1V3 FCC Report SAR_App A_Photos & Ant. Locations

4788103295-S1V3 FCC Report SAR_App B_Highest SAR Test Plots

4788103295-S1V3 FCC Report SAR_App C_System Check Plots

4788103295-S1V3 FCC Report SAR_App D_SAR Tissue Ingredients

4788103295-S1V3 FCC Report SAR_App E_Probe Cal. Certificates

4788103295-S1V3 FCC Report SAR_App F_Dipole Cal. Certificates

END OF REPORT

This report shall not be reproduced except in full, without the written approval of UL Korea, Ltd.