FCC SAR Test Report

APPLICANT	:	Motorola Mobility, LLC
EQUIPMENT	:	Mobile Cellular Phone
BRAND NAME	:	Motorola
MODEL NAME	:	7524
FCC ID	:	IHDT56VC2
STANDARD	:	FCC 47 CFR Part 2 (2.1093) ANSI/IEEE C95.1-1992 IEEE 1528-2013

We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the procedures and had been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC., the test report shall not be reproduced except in full.

Reviewed by: Eric Huang / Deputy Manager

Approved by: Jones Tsai / Manager

Testing Laboratory
1190

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Revision History

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA651612-02	Rev. 01	Initial issue of report	Jul. 08, 2016
FA651612-02	Rev. 02	Update LTE power table on page 35 and page 42	Aug. 19, 2016

1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for Motorola Mobility, LLC, Mobile Cellular Phone, 7524 are as follows.

Equipment Class	Frequency Band	Highest SAR Summary				Highest Simultaneous Transmission 1g SAR (W/kg)
		Head (Separation 0mm)	Body-worn (Separation 10mm)	Hotspot (Separation 10mm)	Specific Product (Separation 0mm)	
		1g SAR (W/kg)			10g SAR (W/kg)	
Licensed	GSM850	0.37	1.05	1.05		1.58
	GSM1900	0.23	0.71	0.68		
	WCDMA II	0.41	1.15	1.15		
	WCDMA IV	0.34	1.03	1.19		
	WCDMA V	0.48	1.01	1.01		
	LTE Band 2	0.39	1.15	1.18		
	LTE Band 4	0.31	0.98	1.09		
	LTE Band 5	0.34	1.03	0.93		
	LTE Band 7	0.39	0.96	1.08		
	LTE Band 12	0.27	1.08	1.08		
	LTE Band 41	0.27	0.80	0.80		
DTS	2.4GHz WLAN	1.39	0.31	0.31		1.58
NII	5GHz WLAN	1.45	0.28	0.26	1.14	1.45
DSS	Bluetooth		0.02			1.16
Date of Testing:		2016/6/8 ~ 2016/6/29				

This device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6 W/kg for Partial-Body, 4.0 W/kg for Product Specific) specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-1992, and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2013 and FCC KDB publications

2. Administration Data

Testing Laboratory	
Test Site	SPORTON INTERNATIONAL INC.
Test Site Location	No.52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Taoyuan City, Taiwan (R.O.C.) TEL: +886-3-327-3456 FAX: +886-3-328-4978

Applicant	
Company Name	Motorola Mobility, LLC
Address	222 W Merchandise Mart Plaza, Suite 1800, Chicago, IL 60654, United States

Manufacturer	
Company Name	Motorola Mobility, LLC
Address	222 W Merchandise Mart Plaza, Suite 1800, Chicago, IL 60654, United States

3. Guidance Standard

The Specific Absorption Rate (SAR) testing specification, method, and procedure for this device is in accordance with the following standards:

- FCC 47 CFR Part 2 (2.1093)
- ANSI/IEEE C95.1-1992
- IEEE 1528-2013
- FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04
- FCC KDB 865664 D02 SAR Reporting v01r02
- FCC KDB 447498 D01 General RF Exposure Guidance v06
- FCC KDB 648474 D04 SAR Evaluation Considerations for Wireless Handsets v01r03
- FCC KDB 248227 D01 802.11 Wi-Fi SAR v02r02
- FCC KDB 941225 D01 3G SAR Procedures v03r01
- FCC KDB 941225 D05 SAR for LTE Devices v02r05
- FCC KDB 941225 D05A Rel.10 LTE SAR Test Guidance v01r02
- FCC KDB 941225 D06 Hotspot Mode SAR v02r01

4. Equipment Under Test (EUT) Information

4.1 General Information

Product Feature & Specification	
Equipment Name	Mobile Cellular Phone
Brand Name	Motorola
Model Name	7524
FCC ID	IHDT56VC2
IMEI Code	354131070010694
Wireless Technology and Frequency Range	GSM850: 824.2 MHz ~ 848.8 MHz GSM1900: 1850.2 MHz ~ 1909.8 MHz WCDMA Band II: 1852.4 MHz ~ 1907.6 MHz WCDMA Band IV: 1712.4 MHz ~ 1752.6 MHz WCDMA Band V: 826.4 MHz ~ 846.6 MHz LTE Band 2: 1850 MHz ~ 1910 MHz LTE Band 4: 1710 MHz ~ 1755 MHz LTE Band 5: 824 MHz ~ 849 MHz LTE Band 7: 2500 MHz ~ 2570 MHz LTE Band 12: 699 MHz ~ 716 MHz LTE Band 17: 704 MHz ~ 716 MHz LTE Band 38: 2570 MHz ~ 2620 MHz LTE Band 41: 2545 MHz ~ 2655 MHz WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz WLAN 5.2GHz Band: 5180 MHz ~ 5240 MHz WLAN 5.3GHz Band: 5260 MHz ~ 5320 MHz WLAN 5.5GHz Band: 5500 MHz ~ 5720 MHz WLAN 5.8GHz Band: 5745 MHz ~ 5825 MHz Bluetooth: 2402 MHz ~ 2480 MHz NFC: 13.56 MHz
Mode	· GSM/GPRS/EGPRS · RMC/AMR 12.2Kbps · HSDPA · HSUPA · DC-HSDPA · LTE: QPSK, 16QAM · 802.11a/b/g/n HT20/HT40 · Bluetooth with EDR / LE · NFC:ASK
GSM / (E)GPRS Transfer mode	Class B – EUT cannot support Packet Switched and Circuit Switched Network simultaneously but can automatically switch between Packet and Circuit Switched Network.
EUT Stage	Identical Prototype

Remark:

1. This device 2.4GHz / 5.2GHz / 5.8GHz WLAN supports Hotspot operation and WiFi Direct (Group Client / Group Owner), and 5.3GHz / 5.5GHz WLAN supports WiFi Direct (Group Client).
2. While operating in “Front” and “Back” configuration by end user, the device will limit different maximum output powers on the GSM850, WCDMA B5 and LTE B5 / B12 / B17 transmitter and detail descriptions of the power reduction mechanism are included in the operational description.
3. During a mobile hotspot session, the device will reduced output powers on the GSM850, WCDMA B5 and LTE B5 / B12 / B17 transmitter and detail descriptions of the power reduction mechanism are included in the operational description.
4. This device utilizes dynamic antenna tuning when in the low frequency band transmitter for head and body-worn exposure condition. Please refer to the operational description for functionality description. The test results for this specific condition are labeled as Triggered in the Antenna Tuner column contained in the section14 of the report.

4.2 Re-use of Measured Data

1. Introduction Section

Portions of the design of (FCC ID: IHDT56VC2, model: 7524) and (FCC ID: IHDT56VC1, model: 5892) are electrically identical. Thus, for some bands, the certification data collected on (FCC ID: IHDT56VC1, model: 5892) can be taken to be representative of (FCC ID: IHDT56VC2, model: 7524). (FCC ID: IHDT56VC2, model: 7524) will reuse the SAR test results from (FCC ID: IHDT56VC1, model: 5892)

The re-used SAR data includes the following bands provided in Appendix D-1 and Appendix D-2 (Sporton SAR Report No. FA651612 for the reference device FCC ID: IHDT56VC1, model: 5892)
- GSM850/1900, WCDMA B5, LTE B5/B7, 2.4GHz/5GHz WLAN and Bluetooth.

The applicant takes full responsibility that the test data as referenced in this section represent compliance for this FCC ID.

2. Difference Section

(FCC ID: IHDT56VC2, model: 7524) is a variant model of (FCC ID: IHDT56VC1, model: 5892) with some additional transmission bands enabled and some disabled because of market segmentation. The available bands of these two models are controlled by software designed for each target market and won't impact the performance of WWAN/WLAN. All the divergent bands have been properly tested to ensure compliance. The detailed comparison of (FCC ID: IHDT56VC2, model: 7524) and (FCC ID: IHDT56VC1, model: 5892) is included in the Operational Description.

3. Spot Check Verification Data Section

In order to confirm hardware similarity of the subject device with the reference device, Spot check has been performed on (FCC ID: IHDT56VC2, model: 7524) for certain parameters, the SAR test results are significantly consistent with its parent model (FCC ID: IHDT56VC1, model: 5892).

4. Reference detail Section:

Equipment Class	Reference FCC ID	Folder Test/RF Exposure	Report Title/Section
PCE	IHDT56VC1	RF Exposure (FA651612)	All sections applicable
DTS	IHDT56VC1	RF Exposure (FA651612)	All sections applicable
NII	IHDT56VC1	RF Exposure (FA651612)	All sections applicable
DSS	IHDT56VC1	RF Exposure (FA651612)	All sections applicable

4.3 General LTE SAR Test and Reporting Considerations

Summarized necessary items addressed in KDB 941225 D05 v02r05	
FCC ID	IHDT56VC2
Equipment Name	Mobile Cellular Phone
Operating Frequency Range of each LTE transmission band	LTE Band 02: 1850 MHz ~ 1910 MHz LTE Band 04: 1710 MHz ~ 1755 MHz LTE Band 05: 824 MHz ~ 849 MHz LTE Band 07: 2500 MHz ~ 2570 MHz LTE Band 12: 699 MHz ~ 716 MHz LTE Band 17: 704 MHz ~ 716 MHz LTE Band 38: 2570 MHz ~ 2620 MHz LTE Band 41: 2545 MHz ~ 2655 MHz
Channel Bandwidth	LTE Band 02:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz LTE Band 04:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz LTE Band 05:1.4MHz, 3MHz, 5MHz, 10MHz LTE Band 07: 5MHz, 10MHz, 15MHz, 20MHz LTE Band 12:1.4MHz, 3MHz, 5MHz, 10MHz LTE Band 17: 5MHz, 10MHz LTE Band 38: 5MHz, 10MHz, 15MHz, 20MHz LTE Band 41: 5MHz, 10MHz, 15MHz, 20MHz
uplink modulations used	QPSK, and 16QAM
LTE Voice / Data requirements	Voice and Data
LTE MPR permanently built-in by design	**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
LTE A-MPR	In the base station simulator configuration, Network Setting value is set to NS_01 to disable A-MPR during SAR testing and the LTE SAR tests was transmitting on all TTI frames (Maximum TTI)
Spectrum plots for RB configuration	A properly configured base station simulator was used for the SAR and power measurement; therefore, spectrum plots for each RB allocation and offset configuration are not included in the SAR report.
Power reduction applied to satisfy SAR compliance	Yes, when operating in hotspot mode that LTE B5 / B12 / B17 power reduction applied to satisfy SAR compliance.
LTE Carrier Aggregation Combinations	Inter-Band and Intra-Band possible combinations and the detail power verification please referred to page57.
LTE Carrier Aggregation Additional Information	This device supports a maximum of 3 carriers in the downlink only. All uplink communications are identical to the Release 8 Specifications. Uplink communications are done on the PCC. Due to carrier capability, only the combinations listed above are supported. The following LTE Release features are not supported: Relay, HetNet, Enhanced MIMO, eICI, WiFi Offloading, MDH, eMBMA, Cross-Carrier Scheduling, Enhanced SC-FDMA.

Transmission (H, M, L) channel numbers and frequencies in each LTE band

LTE Band 2

	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	18607	1850.7	18615	1851.5	18625	1852.5	18650	1855	18675	1857.5	18700	1860
M	18900	1880	18900	1880	18900	1880	18900	1880	18900	1880	18900	1880
H	19193	1909.3	19185	1908.5	19175	1907.5	19150	1905	19125	1902.5	19100	1900

LTE Band 4												
	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	19957	1710.7	19965	1711.5	19975	1712.5	20000	1715	20025	1717.5	20050	1720
M	20175	1732.5	20175	1732.5	20175	1732.5	20175	1732.5	20175	1732.5	20175	1732.5
H	20393	1754.3	20385	1753.5	20375	1752.5	20350	1750	20325	1747.5	20300	1745

LTE Band 5								
	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	20407	824.7	20415	825.5	20425	826.5	20450	829
M	20525	836.5	20525	836.5	20525	836.5	20525	836.5
H	20643	848.3	20635	847.5	20625	846.5	20600	844

LTE Band 7								
	Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	20775	2502.5	20800	2505	20825	2507.5	20850	2510
M	21100	2535	21100	2535	21100	2535	21100	2535
H	21425	2567.5	21400	2565	21375	2562.5	21350	2560

LTE Band 12								
	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	23017	699.7	23025	700.5	23035	701.5	23060	704
M	23095	707.5	23095	707.5	23095	707.5	23095	707.5
H	23173	715.3	23165	714.5	23155	713.5	23130	711

LTE Band 17				
	Bandwidth 5 MHz		Bandwidth 10 MHz	
	Channel #	Freq.(MHz)	Channel #	Freq. (MHz)
L	23755	706.5	23780	709
M	23790	710	23790	710
H	23825	713.5	23800	711

LTE Band 38								
	Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	37775	2572.5	37800	2575	37825	2577.5	37850	2580
M	38000	2595	38000	2595	38000	2595	38000	2595
H	38225	2617.5	38200	2615	38175	2612.5	38150	2610

LTE Band 41								
	Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	40165	2547.5	40190	2550	40215	2552.5	40240	2555
L M	40515	2582.5	40523	2583.3	40532	2584	40540	2585
H M	40865	2617.5	40857	2616.7	40848	2615	40840	2615
H	41215	2652.5	41190	2650	41165	2647.5	41140	2645

5. RF Exposure Limits

5.1 Uncontrolled Environment

Uncontrolled Environments are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure. The general population/uncontrolled exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Members of the general public would come under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity.

5.2 Controlled Environment

Controlled Environments are defined as locations where there is exposure that may be incurred by persons who are aware of the potential for exposure, (i.e. as a result of employment or occupation). In general, occupational/controlled exposure limits are applicable to situations in which persons are exposed as a consequence of their employment, who have been made fully aware of the potential for exposure and can exercise control over their exposure. The exposure category is also applicable when the exposure is of a transient nature due to incidental passage through a location where the exposure levels may be higher than the general population/uncontrolled limits, but the exposed person is fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means.

Limits for Occupational/Controlled Exposure (W/kg)

Whole-Body	Partial-Body	Hands, Wrists, Feet and Ankles
0.4	8.0	20.0

Limits for General Population/Uncontrolled Exposure (W/kg)

Whole-Body	Partial-Body	Hands, Wrists, Feet and Ankles
0.08	1.6	4.0

1. Whole-Body SAR is averaged over the entire body, partial-body SAR is averaged over any 1gram of tissue defined as a tissue volume in the shape of a cube. SAR for hands, wrists, feet and ankles is averaged over any 10 grams of tissue defined as a tissue volume in the shape of a cube.

6. Specific Absorption Rate (SAR)

6.1 Introduction

SAR is related to the rate at which energy is absorbed per unit mass in an object exposed to a radio field. The SAR distribution in a biological body is complicated and is usually carried out by experimental techniques or numerical modeling. The standard recommends limits for two tiers of groups, occupational/controlled and general population/uncontrolled, based on a person's awareness and ability to exercise control over his or her exposure. In general, occupational/controlled exposure limits are higher than the limits for general population/uncontrolled.

6.2 SAR Definition

The SAR definition is the time derivative (rate) of the incremental energy (dW) absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dv) of a given density (ρ). The equation description is as below:

$$\mathbf{SAR} = \frac{\mathbf{d}}{\mathbf{dt}}\left(\frac{\mathbf{dW}}{\mathbf{dm}}\right) = \frac{\mathbf{d}}{\mathbf{dt}}\left(\frac{\mathbf{dW}}{\boldsymbol{\rho}\mathbf{dv}}\right)$$

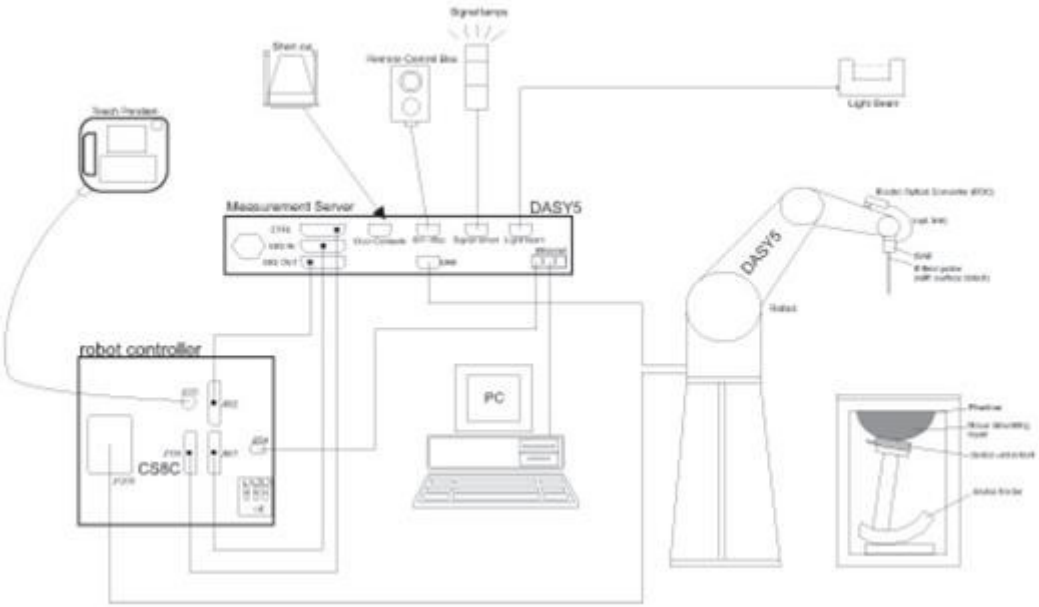
SAR is expressed in units of Watts per kilogram (W/kg)

$$\mathbf{SAR} = \frac{\boldsymbol{\sigma}|\mathbf{E}|^2}{\boldsymbol{\rho}}$$

Where: σ is the conductivity of the tissue, ρ is the mass density of the tissue and E is the RMS electrical field strength.

7. System Description and Setup

The DASY 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.

7.1 E-Field Probe

The SAR measurement is conducted with the dosimetric probe (manufactured by SPEAG).The probe is specially designed and calibrated for use in liquid with high permittivity. The dosimetric probe has special calibration in liquid at different frequency. This probe has a built in optical surface detection system to prevent from collision with phantom.

<ES3DV3 Probe>

Construction	Symmetric design with triangular core Interleaved sensors Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)	
Frequency	10 MHz – 4 GHz; Linearity: ±0.2 dB (30 MHz – 4 GHz)	
Directivity	±0.2 dB in TSL (rotation around probe axis) ±0.3 dB in TSL (rotation normal to probe axis)	
Dynamic Range	5 µW/g – >100 mW/g; Linearity: ±0.2 dB	
Dimensions	Overall length: 337 mm (tip: 20 mm) Tip diameter: 3.9 mm (body: 12 mm) Distance from probe tip to dipole centers: 3.0 mm	

<EX3DV4 Probe>

Construction	Symmetric design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)	
Frequency	10 MHz – >6 GHz Linearity: ±0.2 dB (30 MHz – 6 GHz)	
Directivity	±0.3 dB in TSL (rotation around probe axis) ±0.5 dB in TSL (rotation normal to probe axis)	
Dynamic Range	10 µW/g – >100 mW/g Linearity: ±0.2 dB (noise: typically <1 µW/g)	
Dimensions	Overall length: 337 mm (tip: 20 mm) Tip diameter: 2.5 mm (body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm	

7.2 Data Acquisition Electronics (DAE)

The data acquisition electronics (DAE) consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit. Transmission to the measurement server is accomplished through an optical downlink for data and status information as well as an optical uplink for commands and the clock.

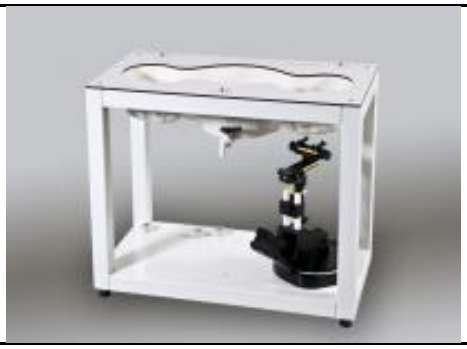
The input impedance of the DAE is 200 MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.

Fig 5.1 Photo of DAE

7.3 Phantom

<SAM Twin Phantom>

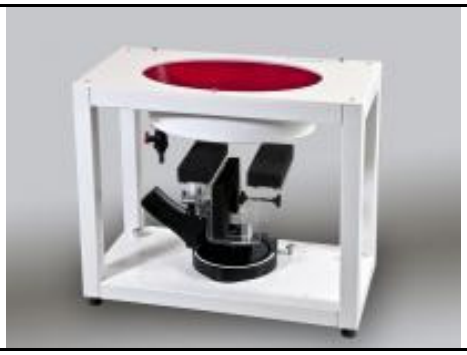
Shell Thickness	2 ± 0.2 mm; Center ear point: 6 ± 0.2 mm
Filling Volume	Approx. 25 liters
Dimensions	Length: 1000 mm; Width: 500 mm; Height: adjustable feet
Measurement Areas	Left Hand, Right Hand, Flat Phantom



The bottom plate contains three pair of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections. A white cover is provided to tap the phantom during off-periods to prevent water evaporation and changes in the liquid parameters. On the phantom top, three reference markers are provided to identify the phantom position with respect to the robot.

<ELI Phantom>

Shell Thickness	2 ± 0.2 mm (sagging: <1%)
Filling Volume	Approx. 30 liters
Dimensions	Major ellipse axis: 600 mm Minor axis: 400 mm



The ELI phantom is intended for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI4 is fully compatible with standard and all known tissue simulating liquids.

7.4 Device Holder

<Mounting Device for Hand-Held Transmitter>

In combination with the Twin SAM V5.0/V5.0c or ELI phantoms, the Mounting Device for Hand-Held Transmitters enables rotation of the mounted transmitter device to specified spherical coordinates. At the heads, the rotation axis is at the ear opening. Transmitter devices can be easily and accurately positioned according to IEC 62209-1, IEEE 1528, FCC, or other specifications. The device holder can be locked for positioning at different phantom sections (left head, right head, flat). And upgrade kit to Mounting Device to enable easy mounting of wider devices like big smart-phones, e-books, small tablets, etc. It holds devices with width up to 140 mm.

Mounting Device for Hand-Held Transmitters

Mounting Device Adaptor for Wide-Phones

<Mounting Device for Laptops and other Body-Worn Transmitters>

The extension is lightweight and made of POM, acrylic glass and foam. It fits easily on the upper part of the mounting device in place of the phone positioned. The extension is fully compatible with the SAM Twin and ELI phantoms.

Mounting Device for Laptops

8. Measurement Procedures

The measurement procedures are as follows:

<Conducted power measurement>

(a) For WWAN power measurement, use base station simulator to configure EUT WWAN transmission in conducted connection with RF cable, at maximum power in each supported wireless interface and frequency band.
(b) Read the WWAN RF power level from the base station simulator.
(c) For WLAN/BT power measurement, use engineering software to configure EUT WLAN/BT continuously transmission, at maximum RF power in each supported wireless interface and frequency band
(d) Connect EUT RF port through RF cable to the power meter, and measure WLAN/BT output power

<SAR measurement>

(a) Use base station simulator to configure EUT WWAN transmission in radiated connection, and engineering software to configure EUT WLAN/BT continuously transmission, at maximum RF power, in the highest power channel.
(b) Place the EUT in the positions as Exhibit 7C_SAR Setup Photo demonstrates.
(c) Set scan area, grid size and other setting on the DASY software.
(d) Measure SAR results for the highest power channel on each testing position.
(e) Find out the largest SAR result on these testing positions of each band
(f) Measure SAR results for other channels in worst SAR testing position if the reported SAR of highest power channel is larger than 0.8 W/kg

According to the test standard, the recommended procedure for assessing the peak spatial-average SAR value consists of the following steps:

(a) Power reference measurement
(b) Area scan
(c) Zoom scan
(d) Power drift measurement

8.1 Spatial Peak SAR Evaluation

The procedure for spatial peak SAR evaluation has been implemented according to the test standard. It can be conducted for 1g and 10g, as well as for user-specific masses. The DASY software includes all numerical procedures necessary to evaluate the spatial peak SAR value.

The base for the evaluation is a "cube" measurement. The measured volume must include the 1g and 10g cubes with the highest averaged SAR values. For that purpose, the center of the measured volume is aligned to the interpolated peak SAR value of a previously performed area scan.

The entire evaluation of the spatial peak values is performed within the post-processing engine (SEMCAD). The system always gives the maximum values for the 1g and 10g cubes. The algorithm to find the cube with highest averaged SAR is divided into the following stages:

(a) Extraction of the measured data (grid and values) from the Zoom Scan
(b) Calculation of the SAR value at every measurement point based on all stored data (A/D values and measurement parameters)
(c) Generation of a high-resolution mesh within the measured volume
(d) Interpolation of all measured values form the measurement grid to the high-resolution grid
(e) Extrapolation of the entire 3-D field distribution to the phantom surface over the distance from sensor to surface
(f) Calculation of the averaged SAR within masses of 1g and 10g

8.2 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. This distance cannot be smaller than the distance of sensor calibration points to probe tip as defined in the probe properties.

8.3 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 found in the scanned area, within a range of the global maximum. The range (in dB0 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 FCC KDB 865664 D01v01r04 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.	

8.4 Zoom Scan

Zoom scans are used assess the peak spatial SAR values within a cubic averaging volume containing 1 gram and 10 gram of simulated tissue. The zoom scan measures points (refer to table below) within a cube shoes 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 gram and 10 gram and displays these values next to the job's label.

Zoom scan parameters extracted from FCC KDB 865664 D01v01r04 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.

8.5 Volume Scan Procedures

The volume scan is used for assess overlapping SAR distributions for antennas transmitting in different frequency bands. It is equivalent to an oversized zoom scan used in standalone measurements. The measurement volume will be used to enclose all the simultaneous transmitting antennas. For antennas transmitting simultaneously in different frequency bands, the volume scan is measured separately in each frequency band. In order to sum correctly to compute the 1g aggregate SAR, the EUT remain in the same test position for all measurements and all volume scan use the same spatial resolution and grid spacing. When all volume scan were completed, the software, SEMCAD postprocessor can combine and subsequently superpose these measurement data to calculating the multiband SAR.

8.6 Power Drift Monitoring

All SAR testing is under the EUT install full charged battery and transmit maximum output power. In DASY measurement software, the power reference measurement and power drift measurement procedures are used for monitoring the power drift of EUT during SAR test. Both these procedures measure the field at a specified reference position before and after the SAR testing. The software will calculate the field difference in dB. If the power drifts more than 5%, the SAR will be retested.

9. Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
SPEAG	750MHz System Validation Kit	D750V3	1012	May. 18, 2016	May. 17, 2017
SPEAG	1750MHz System Validation Kit	D1750V2	1068	Nov. 23, 2015	Nov. 22, 2016
SPEAG	1900MHz System Validation Kit	D1900V2	5d041	Oct. 22, 2015	Oct. 21, 2016
SPEAG	2600MHz System Validation Kit	D2600V2	1008	Aug. 19, 2015	Aug. 18, 2016
SPEAG	Data Acquisition Electronics	DAE4	778	May. 12, 2016	May. 11, 2017
SPEAG	Data Acquisition Electronics	DAE4	1399	Nov. 23, 2015	Nov. 22, 2016
SPEAG	Dosimetric E-Field Probe	ES3DV3	3270	Sep. 28, 2015	Sep. 27, 2016
SPEAG	Dosimetric E-Field Probe	EX3DV4	3955	Nov. 24, 2015	Nov. 23, 2016
WonDer	Thermometer	WD-5015	TM281	Oct. 16, 2015	Oct. 15, 2016
Wisewind	Thermometer	HTC-1	TM225	Oct. 16, 2015	Oct. 15, 2016
Anritsu	Radio Communication Analyzer	MT8820C	6201341950	Dec. 18, 2015	Dec. 17, 2016
Agilent	Wireless Communication Test Set	E5515C	MY50266977	May. 17, 2016	May. 16, 2017
SPEAG	Device Holder	N/A	N/A	N/A	N/A
R&S	Signal Generator	MG3710A	6201502524	Dec. 18, 2015	Dec. 17, 2016
Agilent	ENA Network Analyzer	E5071C	MY46316648	Jan. 12, 2016	Jan. 11, 2017
SPEAG	Dielectric Probe Kit	DAK-3.5	1126	Jul. 21, 2015	Jul. 20, 2016
LINE SEIKI	Digital Thermometer	LKMelectronic	DTM3000SPEZIAL/90900	Aug. 26, 2015	Aug. 25, 2016
Anritsu	Power Meter	ML2495A	1419002	May. 10, 2016	May. 09, 2017
Anritsu	Power Sensor	MA2411B	1339124	May. 10, 2016	May. 09, 2017
Agilent	Spectrum Analyzer	E4408B	MY44211028	Aug. 24, 2015	Aug. 23, 2016
ATM	Dual Directional Coupler	C122H-10	P610410z-02	Note 1	
Woken	Attenuator 1	WK0602-XX	N/A	Note 1	
PE	Attenuator 2	PE7005-10	N/A	Note 1	
PE	Attenuator 3	PE7005- 3	N/A	Note 1	
AR	Power Amplifier	5S1G4M2	0328767	Note 1	
Mini-Circuits	Power Amplifier	ZVE-3W	162601250	Note 1	

General Note:

1. Prior to system verification and validation, the path loss from the signal generator to the system check source and the power meter, which includes the amplifier, cable, attenuator and directional coupler, was measured by the network analyzer. The reading of the power meter was offset by the path loss difference between the path to the power meter and the path to the system check source to monitor the actual power level fed to the system check source.

10. System Verification

10.1 Tissue Verification

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

Frequency (MHz)	Water (%)	Sugar (%)	Cellulose (%)	Salt (%)	Preventol (%)	DGBE (%)	Conductivity (σ)	Permittivity (εr)
For Head								
750	41.1	57.0	0.2	1.4	0.2	0	0.89	41.9
835	40.3	57.9	0.2	1.4	0.2	0	0.90	41.5
900	40.3	57.9	0.2	1.4	0.2	0	0.97	41.5
1800, 1900, 2000	55.2	0	0	0.3	0	44.5	1.40	40.0
2450	55.0	0	0	0	0	45.0	1.80	39.2
2600	54.8	0	0	0.1	0	45.1	1.96	39.0
For Body								
750	51.7	47.2	0	0.9	0.1	0	0.96	55.5
835	50.8	48.2	0	0.9	0.1	0	0.97	55.2
900	50.8	48.2	0	0.9	0.1	0	1.05	55.0
1800, 1900, 2000	70.2	0	0	0.4	0	29.4	1.52	53.3
2450	68.6	0	0	0	0	31.4	1.95	52.7
2600	68.1	0	0	0.1	0	31.8	2.16	52.5

Simulating Liquid for 5GHz, Manufactured by SPEAG

Ingredients	(% by weight)
Water	64~78%
Mineral oil	11~18%
Emulsifiers	9~15%
Additives and Salt	2~3%

<Tissue Dielectric Parameter Check Results>

Frequency (MHz)	Tissue Type	Liquid Temp. (℃)	Conductivity (σ)	Permittivity (ε_r)	Conductivity Target (σ)	Permittivity Target (ε_r)	Delta (σ) (%)	Delta (ε_r) (%)	Limit (%)	Date
750	HSL	22.3	0.891	42.518	0.89	41.90	0.11	1.47	±5	2016/6/8
750	HSL	22.5	0.890	41.481	0.89	41.90	0.00	-1.00	±5	2016/6/28
750	MSL	22.6	0.970	56.534	0.96	55.50	1.04	1.86	±5	2016/6/27
750	MSL	22.5	0.965	56.454	0.96	55.50	0.52	1.72	±5	2016/6/29
1750	HSL	22.6	1.358	40.311	1.37	40.10	-0.88	0.53	±5	2016/6/9
1750	HSL	22.6	1.379	40.582	1.37	40.10	0.66	1.20	±5	2016/6/28
1750	MSL	22.3	1.537	55.571	1.49	53.40	3.15	4.07	±5	2016/6/25
1900	HSL	22.1	1.434	41.065	1.40	40.00	2.43	2.66	±5	2016/6/8
1900	MSL	22.3	1.524	55.326	1.52	53.30	0.26	3.80	±5	2016/6/26
2600	HSL	22.1	1.911	37.595	1.96	39.00	-2.50	-3.60	±5	2016/6/8
2600	MSL	22.6	2.188	52.310	2.16	52.50	1.30	-0.36	±5	2016/6/27

<Tissue Dielectric Parameter Check for Low / Middle / High Frequencies>

General Note:

The tissue measure results for low / middle / high frequencies list below, the results were used in the Dasy SAR system to perform interpolation to determine the dielectric parameters on the SAR test device. The SAR test plots may slightly difference between the tables below due to the digit rounding in the software calculated.

CH	Frequency (MHz)	Liquid Type	Conductivity (σ)	Permittivity (ε_r)	Conductivity Target (σ)	Permittivity Target (ε_r)	Delta (σ) (%)	Delta (ε_r) (%)	Limit (%)	Date
9262	1852.4	Head	1.384	41.280	1.400	40.000	-1.14	3.20	±5	2016/6/8
9400	1880	Head	1.412	41.160	1.400	40.000	0.86	2.90	±5	2016/6/8
9538	1907.6	Head	1.442	41.030	1.400	40.000	3.00	2.58	±5	2016/6/8
18700	1860	Head	1.392	41.260	1.400	40.000	-0.57	3.15	±5	2016/6/8
18900	1880	Head	1.412	41.160	1.400	40.000	0.86	2.90	±5	2016/6/8
19100	1900	Head	1.434	41.070	1.400	40.000	2.43	2.68	±5	2016/6/8
23060	704	Head	0.848	43.190	0.890	42.150	-4.72	2.35	±5	2016/6/8
23095	707.5	Head	0.851	43.150	0.890	42.130	-4.38	2.49	±5	2016/6/8
23130	711	Head	0.855	43.100	0.890	42.110	-3.93	2.38	±5	2016/6/8
40240	2555	Head	1.860	37.773	1.900	39.100	-2.11	-3.39	±5	2016/6/8
40540	2585	Head	1.894	37.648	1.900	39.000	-0.32	-3.47	±5	2016/6/8
40840	2615	Head	1.925	37.541	2.000	39.000	-3.75	-3.74	±5	2016/6/8
41140	2645	Head	1.958	37.410	2.000	38.900	-2.10	-3.83	±5	2016/6/8
1312	1712.4	Head	1.322	40.450	1.350	40.160	-2.07	0.62	±5	2016/6/9
1413	1732.6	Head	1.341	40.360	1.360	40.130	-1.40	0.65	±5	2016/6/9
1513	1752.6	Head	1.360	40.310	1.370	40.090	-0.73	0.52	±5	2016/6/9
20050	1720	Body	1.504	55.708	1.474	53.456	2.31	4.13	±5	2016/6/25
20175	1732.5	Body	1.518	55.649	1.481	53.433	2.56	4.21	±5	2016/6/25
20300	1745	Body	1.532	55.587	1.487	53.409	2.81	4.09	±5	2016/6/25
1312	1712.4	Body	1.495	55.748	1.471	53.471	1.70	4.20	±5	2016/6/25
1413	1732.6	Body	1.519	55.647	1.481	53.433	2.64	4.21	±5	2016/6/25
1513	1752.6	Body	1.540	55.561	1.492	53.395	3.36	4.05	±5	2016/6/25
18700	1860	Body	1.478	55.483	1.520	53.300	-2.79	4.10	±5	2016/6/26
18900	1880	Body	1.499	55.415	1.520	53.300	-1.36	3.97	±5	2016/6/26
19100	1900	Body	1.524	55.326	1.520	53.300	0.24	3.80	±5	2016/6/26
9262	1852.4	Body	1.469	55.500	1.520	53.300	-3.36	4.13	±5	2016/6/26
9400	1880	Body	1.499	55.415	1.520	53.300	-1.38	3.97	±5	2016/6/26
9538	1907.6	Body	1.534	55.294	1.520	53.300	0.92	3.74	±5	2016/6/26
23060	704	Body	0.927	57.037	0.957	55.684	-3.44	2.40	±5	2016/6/27
23095	707.5	Body	0.930	57.007	0.957	55.670	-3.12	2.35	±5	2016/6/27
23130	711	Body	0.933	56.966	0.957	55.656	-2.76	2.27	±5	2016/6/27

Table of Low/Middle/High Channel for Liquid Validation

CH	Frequency (MHz)	Liquid Type	Conductivity (σ)	Permittivity (εr)	Conductivity Target (σ)	Permittivity Target (εr)	Delta (σ) (%)	Delta (εr) (%)	Limit (%)	Date
23780	709	Body	0.932	56.993	0.957	55.664	-2.97	2.32	±5	2016/6/27
23790	710	Body	0.932	56.978	0.957	55.660	-2.87	2.30	±5	2016/6/27
23800	711	Body	0.933	56.966	0.957	55.656	-2.76	2.27	±5	2016/6/27
37850	2580	Body	2.158	52.384	2.131	52.535	1.32	-0.22	±5	2016/6/27
38000	2595	Body	2.181	52.328	2.153	52.516	1.43	-0.33	±5	2016/6/27
38150	2610	Body	2.200	52.277	2.175	52.497	1.41	-0.43	±5	2016/6/27
40240	2555	Body	2.122	52.486	2.097	52.590	1.05	-0.22	±5	2016/6/27
40540	2585	Body	2.166	52.362	2.139	52.530	1.21	-0.26	±5	2016/6/27
40840	2615	Body	2.207	52.255	2.177	52.485	1.24	-0.47	±5	2016/6/27
41140	2645	Body	2.250	52.122	2.224	52.444	1.35	-0.53	±5	2016/6/27
20050	1720	Head	1.350	40.724	1.356	40.149	-0.71	1.56	±5	2016/6/28
20175	1732.5	Head	1.363	40.664	1.362	40.129	0.22	1.41	±5	2016/6/28
20300	1745	Head	1.375	40.600	1.368	40.108	0.36	1.25	±5	2016/6/28
23060	704	Head	0.851	42.093	0.887	42.145	-4.39	-0.02	±5	2016/6/28
23095	707.5	Head	0.854	42.041	0.887	42.127	-4.00	-0.14	±5	2016/6/28
23130	711	Head	0.857	41.998	0.887	42.108	-3.70	-0.24	±5	2016/6/28
23780	709	Head	0.856	42.022	0.887	42.119	-3.85	-0.19	±5	2016/6/28
23790	710	Head	0.857	42.008	0.887	42.113	-3.74	-0.22	±5	2016/6/28
23800	711	Head	0.857	41.998	0.887	42.108	-3.70	-0.24	±5	2016/6/28
23060	704	Body	0.922	56.957	0.957	55.684	-3.93	2.26	±5	2016/6/29
23095	707.5	Body	0.925	56.927	0.957	55.670	-3.61	2.20	±5	2016/6/29
23130	711	Body	0.929	56.886	0.957	55.656	-3.26	2.13	±5	2016/6/29
23780	709	Body	0.927	56.913	0.957	55.664	-3.46	2.18	±5	2016/6/29
23790	710	Body	0.928	56.898	0.957	55.660	-3.36	2.15	±5	2016/6/29
23800	711	Body	0.929	56.886	0.957	55.656	-3.26	2.13	±5	2016/6/29

Table of Low/Middle/High Channel for Liquid Validation

10.2 System Performance Check Results

Comparing to the original SAR value provided by SPEAG, the verification data should be within its specification of 10 %. Below table shows the target SAR and measured SAR after normalized to 1W input power. The table below indicates the system performance check can meet the variation criterion and the plots can be referred to Appendix A of this report.

Date	Frequency (MHz)	Tissue Type	Input Power (mW)	Dipole S/N	Probe S/N	DAE S/N	Measured 1g SAR (W/kg)	Targeted 1g SAR (W/kg)	Normalized 1g SAR (W/kg)	Deviation (%)
2016/6/8	750	HSL	250	D750V3-1012	ES3DV3 - SN3270	DAE4 Sn1399	1.92	8.21	7.68	-6.46
2016/6/28	750	HSL	250	D750V3-1012	EX3DV4 - SN3955	DAE4 Sn778	2.10	8.21	8.40	2.31
2016/6/27	750	MSL	250	D750V3-1012	EX3DV4 - SN3955	DAE4 Sn778	2.24	8.72	8.96	2.75
2016/6/29	750	MSL	250	D750V3-1012	EX3DV4 - SN3955	DAE4 Sn778	2.24	8.72	8.96	2.75
2016/6/9	1750	HSL	250	D1750V2-1068	ES3DV3 - SN3270	DAE4 Sn1399	9.05	36.80	36.20	-1.63
2016/6/28	1750	HSL	250	D1750V2-1068	EX3DV4 - SN3955	DAE4 Sn778	8.67	36.80	34.68	-5.76
2016/6/25	1750	MSL	250	D1750V2-1068	EX3DV4 - SN3955	DAE4 Sn778	9.35	35.70	37.40	4.76
2016/6/8	1900	HSL	250	D1900V2-5d041	ES3DV3 - SN3270	DAE4 Sn1399	9.94	39.80	39.76	-0.10
2016/6/26	1900	MSL	250	D1900V2-5d041	EX3DV4 - SN3955	DAE4 Sn778	10.50	40.00	42.00	5.00
2016/6/8	2600	HSL	250	D2600V2-1008	ES3DV3 - SN3270	DAE4 Sn1399	14.50	56.30	58.00	3.02
2016/6/27	2600	MSL	250	D2600V2-1008	EX3DV4 - SN3955	DAE4 Sn778	14.90	55.80	59.60	6.81

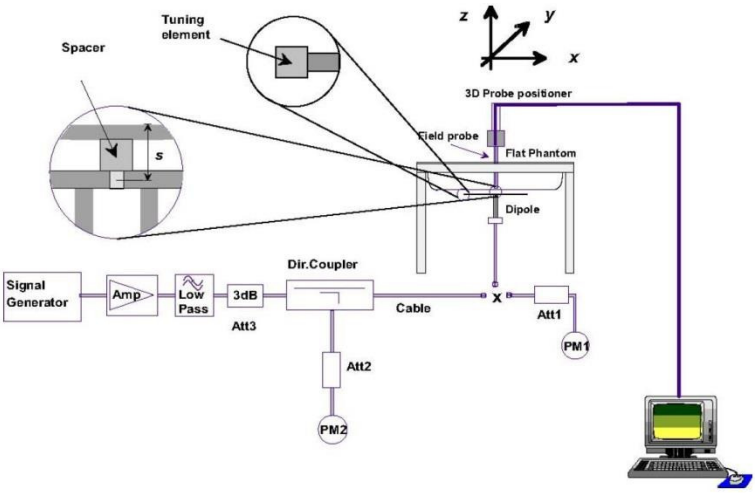


Fig 8.3.1 System Performance Check Setup

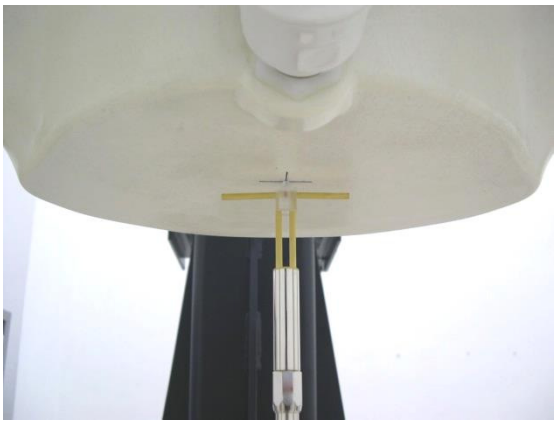


Fig 8.3.2 Setup Photo

11. RF Exposure Positions

11.1 Ear and handset reference point

Figure 9.1.1 shows the front, back, and side views of the SAM phantom. The center-of-mouth reference point is labeled “M,” the left ear reference point (ERP) is marked “LE,” and the right ERP is marked “RE.” Each ERP is 15 mm along the B-M (back-mouth) line behind the entrance-to-ear-canal (EEC) point, as shown in Figure 9.1.2 The Reference Plane is defined as passing through the two ear reference points and point M. The line N-F (neck-front), also called the reference pivoting line, is normal to the Reference Plane and perpendicular to both a line passing through RE and LE and the B-M line (see Figure 9.1.3). Both N-F and B-M lines should be marked on the exterior of the phantom shell to facilitate handset positioning. Posterior to the N-F line the ear shape is a flat surface with 6 mm thickness at each ERP, and forward of the N-F line the ear is truncated, as illustrated in Figure 9.1.2. The ear truncation is introduced to preclude the ear lobe from interfering with handset tilt, which could lead to unstable positioning at the cheek.

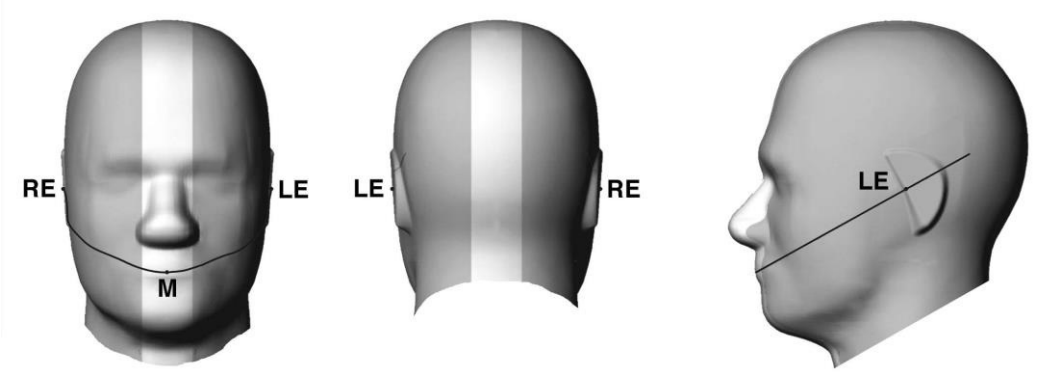


Fig 9.1.1 Front, back, and side views of SAM twin phantom

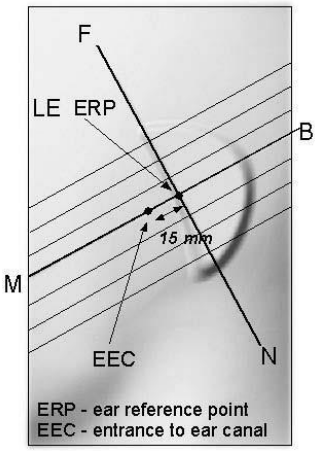


Fig 9.1.2 Close-up side view of phantom showing the ear region.

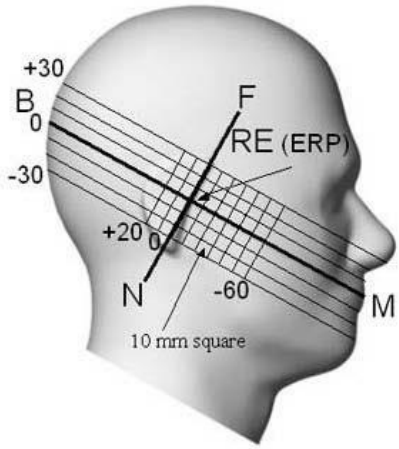


Fig 9.1.3 Side view of the phantom showing relevant markings and seven cross-sectional plane locations

11.2 Definition of the cheek position

1. Ready the handset for talk operation, if necessary. For example, for handsets with a cover piece (flip cover), open the cover. If the handset can transmit with the cover closed, both configurations must be tested.
2. Define two imaginary lines on the handset—the vertical centerline and the horizontal line. The vertical centerline passes through two points on the front side of the handset—the midpoint of the width wt of the handset at the level of the acoustic output (point A in Figure 9.2.1 and Figure 9.2.2), and the midpoint of the width wb of the bottom of the handset (point B). The horizontal line is perpendicular to the vertical centerline and passes through the center of the acoustic output (see Figure 9.2.1). The two lines intersect at point A. Note that for many handsets, point A coincides with the center of the acoustic output; however, the acoustic output may be located elsewhere on the horizontal line. Also note that the vertical centerline is not necessarily parallel to the front face of the handset (see Figure 9.2.2), especially for clamshell handsets, handsets with flip covers, and other irregularly-shaped handsets.
3. Position the handset close to the surface of the phantom such that point A is on the (virtual) extension of the line passing through points RE and LE on the phantom (see Figure 9.2.3), such that the plane defined by the vertical centerline and the horizontal line of the handset is approximately parallel to the sagittal plane of the phantom.
4. Translate the handset towards the phantom along the line passing through RE and LE until handset point A touches the pinna at the ERP.
5. While maintaining the handset in this plane, rotate it around the LE-RE line until the vertical centerline is in the plane normal to the plane containing B-M and N-F lines, i.e., the Reference Plane.
6. Rotate the handset around the vertical centerline until the handset (horizontal line) is parallel to the N-F line.
7. While maintaining the vertical centerline in the Reference Plane, keeping point A on the line passing through RE and LE, and maintaining the handset contact with the pinna, rotate the handset about the N-F line until any point on the handset is in contact with a phantom point below the pinna on the cheek. See Figure 9.2.3. The actual rotation angles should be documented in the test report.

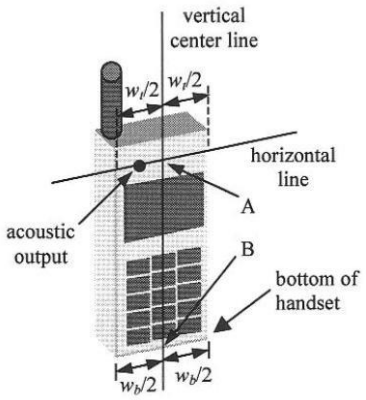


Fig 9.2.1 Handset vertical and horizontal reference lines—"fixed case

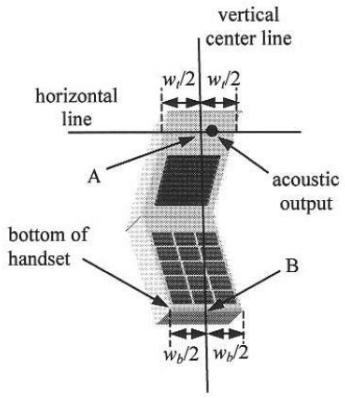


Fig 9.2.2 Handset vertical and horizontal reference lines—"clam-shell case"

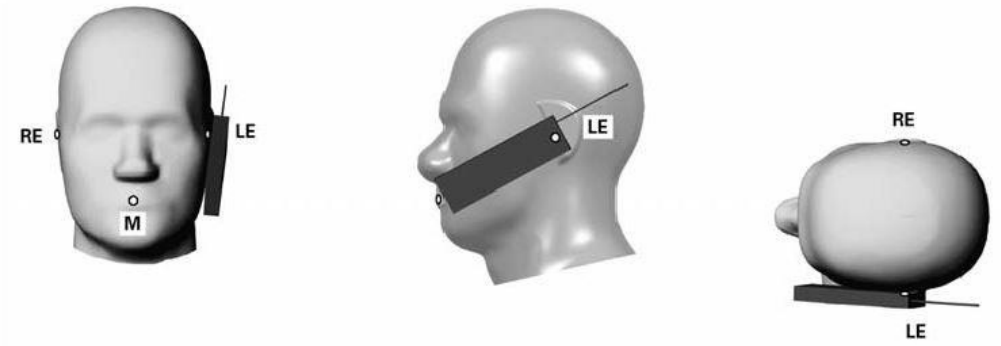


Fig 9.2.3 cheek or touch position. The reference points for the right ear (RE), left ear (LE), and mouth (M), which establish the Reference Plane for handset positioning, are indicated.

11.3 Definition of the tilt position

1. Ready the handset for talk operation, if necessary. For example, for handsets with a cover piece (flip cover), open the cover. If the handset can transmit with the cover closed, both configurations must be tested.
2. While maintaining the orientation of the handset, move the handset away from the pinna along the line passing through RE and LE far enough to allow a rotation of the handset away from the cheek by 15°.
3. Rotate the handset around the horizontal line by 15°.
4. While maintaining the orientation of the handset, move the handset towards the phantom on the line passing through RE and LE until any part of the handset touches the ear. The tilt position is obtained when the contact point is on the pinna. See Figure 9.3.1. If contact occurs at any location other than the pinna, e.g., the antenna at the back of the phantom head, the angle of the handset should be reduced. In this case, the tilt position is obtained if any point on the handset is in contact with the pinna and a second point

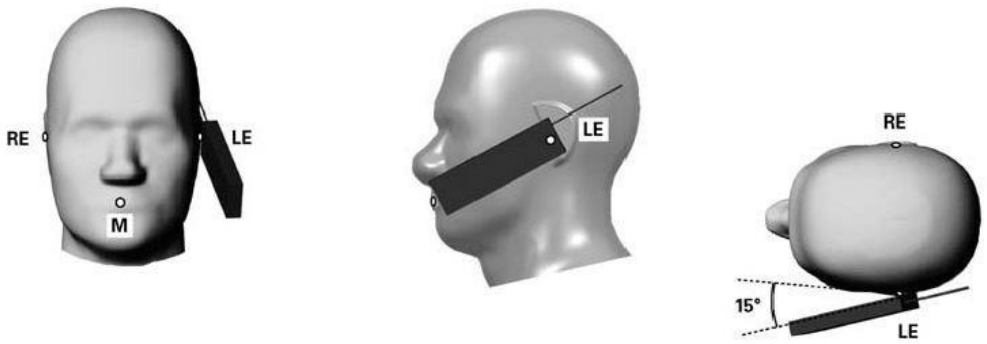


Fig 9.3.1 Tilt position. The reference points for the right ear (RE), left ear (LE), and mouth (M), which define the Reference Plane for handset positioning, are indicated.

11.4 Body Worn Accessory

Body-worn operating configurations are tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in a normal use configuration (see Figure 9.4). Per KDB648474 D04v01r03, body-worn accessory exposure is typically related to voice mode operations when handsets are carried in body-worn accessories. The body-worn accessory procedures in FCC KDB 447498 D01v06 should be used to test for body-worn accessory SAR compliance, without a headset connected to it. This enables the test results for such configuration to be compatible with that required for hotspot mode when the body-worn accessory test separation distance is greater than or equal to that required for hotspot mode, when applicable. When the reported SAR for body-worn accessory, measured without a headset connected to the handset is < 1.2 W/kg, the highest reported SAR configuration for that wireless mode and frequency band should be repeated for that body-worn accessory with a handset attached to the handset.

Accessories for body-worn operation configurations are divided into two categories: those that do not contain metallic components and those that do contain metallic components and those that do contain metallic components. When multiple accessories that do not contain metallic components are supplied with the device, the device is tested with only the accessory that dictates the closest spacing to the body. Then multiple accessories that contain metallic components are test with the device with each accessory. If multiple accessories share an identical metallic component (i.e. the same metallic belt-chip used with different holsters with no other metallic components) only the accessory that dictates the closest spacing to the body is tested.

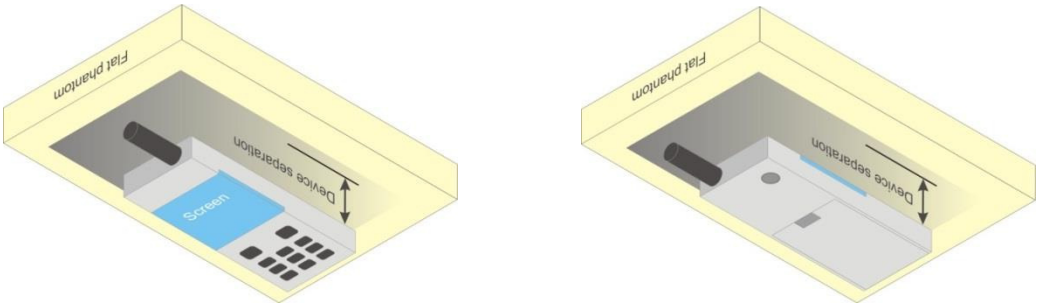


Fig 9.4 Body Worn Position

11.5 Wireless Router

Some battery-operated handsets have the capability to transmit and receive user through simultaneous transmission of WIFI simultaneously with a separate licensed transmitter. The FCC has provided guidance in FCC KDB Publication 941225 D06 v02r01 where SAR test considerations for handsets (L x W ≥ 9 cm x 5 cm) are based on a composite test separation distance of 10mm from the front, back and edges of the device containing transmitting antennas within 2.5cm of their edges, determined form general mixed use conditions for this type of devices. Since the hotspot SAR results may overlap with the body-worn accessory SAR requirements, the more conservative configurations can be considered, thus excluding some body-worn accessory SAR tests.

When the user enables the personal wireless router functions for the handset, actual operations include simultaneous transmission of both the WIFI transmitter and another licensed transmitter. Both transmitters often do not transmit at the same transmitting frequency and thus cannot be evaluated for SAR under actual use conditions due to the limitations of the SAR assessment probes. Therefore, SAR must be evaluated for each frequency transmission and mode separately and spatially summed with the WIFI transmitter according to FCC KDB Publication 447498 D01v06 publication procedures. The “Portable Hotspot” feature on the handset was NOT activated during SAR assessments, to ensure the SAR measurements were evaluated for a single transmission frequency RF signal at a time.

11.6 Product Specific device

For smart phones with a display diagonal dimension > 15.0 cm or an overall diagonal dimension > 16.0 cm that provide similar mobile web access and multimedia support found in mini-tablets or UMPC mini-tablets that support voice calls next to the ear, According to KDB648474 D04v01r03, the following phablet procedures should be applied to evaluate SAR compliance for each applicable wireless modes and frequency band. Devices marketed as phablets, regardless of form factors and operating characteristics must be tested as a phablet to determine SAR compliance

1. The normally required head and body-worn accessory SAR test procedures for handsets, including hotspot mode, must be applied.

2. The UMPC mini-tablet procedures must also be applied to test the SAR of all surfaces and edges with an antenna located at ≤ 25 mm from that surface or edge, in direct contact with a flat phantom, for 10-g extremity SAR according to the body-equivalent tissue dielectric parameters in KDB 865664 to address interactive hand use exposure conditions.6 The UMPC mini-tablet 1-g SAR at 5 mm is not required. When hotspot mode applies, 10-g extremity SAR is required only for the surfaces and edges with hotspot mode 1-g reported SAR > 1.2 W/kg.

12. Conducted RF Output Power (Unit: dBm)

<WCDMA Conducted Power>

1. The following tests were conducted according to the test requirements outlines in 3GPP TS 34.121 specification.
2. The procedures in KDB 941225 D01v03r01 are applied for 3GPP Rel. 6 HSPA to configure the device in the required sub-test mode(s) to determine SAR test exclusion.
3. For DC-HSDPA, the device was configured according to the H-Set 12, Fixed Reference Channel (FRC) configuration in Table C.8.1.12 of 3GPP TS 34.121-1, with the primary and the secondary serving HS-DSCH Cell enabled during the power measurement.

A summary of these settings are illustrated below:

HSDPA Setup Configuration:

a. The EUT was connected to Base Station Agilent E5515C referred to the Setup Configuration.
b. The RF path losses were compensated into the measurements.
c. A call was established between EUT and Base Station with following setting:
   i. Set Gain Factors (β_c and β_d) and parameters were set according to each
   ii. Specific sub-test in the following table, C10.1.4, quoted from the TS 34.121
   iii. Set RMC 12.2Kbps + HSDPA mode.
   iv. Set Cell Power = -86 dBm
   v. Set HS-DSCH Configuration Type to FRC (H-set 1, QPSK)
   vi. Select HSDPA Uplink Parameters
   vii. Set Delta ACK, Delta NACK and Delta CQI = 8
   viii. Set Ack-Nack Repetition Factor to 3
   ix. Set CQI Feedback Cycle (k) to 4 ms
   x. Set CQI Repetition Factor to 2
   xi. Power Ctrl Mode = All Up bits
d. The transmitted maximum output power was recorded.

Table C.10.1.4: β values for transmitter characteristics tests with HS-DPCCH

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{HS} (Note1, Note 2)	CM (dB) (Note 3)	MPR (dB) (Note 3)
1	2/15	15/15	64	2/15	4/15	0.0	0.0
2	12/15 (Note 4)	15/15 (Note 4)	64	12/15 (Note 4)	24/15	1.0	0.0
3	15/15	8/15	64	15/8	30/15	1.5	0.5
4	15/15	4/15	64	15/4	30/15	1.5	0.5

Note 1: Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 30/15 with β_{hs} = 30/15 * β_c.

Note 2: For the HS-DPCCH power mask requirement test in clause 5.2C, 5.7A, and the Error Vector Magnitude (EVM) with HS-DPCCH test in clause 5.13.1A, and HSDPA EVM with phase discontinuity in clause 5.13.1AA, Δ_{ACK} and Δ_{NACK} = 30/15 with β_{hs} = 30/15 * β_c, and Δ_{CQI} = 24/15 with β_{hs} = 24/15 * β_c.

Note 3: CM = 1 for β_c/β_d =12/15, β_{hs}/β_c=24/15. For all other combinations of DPDCH, DPCCH and HS-DPCCH the MPR is based on the relative CM difference. This is applicable for only UEs that support HSDPA in release 6 and later releases.

Note 4: For subtest 2 the β_c/β_d ratio of 12/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to β_c = 11/15 and β_d = 15/15.

Setup Configuration

HSUPA Setup Configuration:

a. The EUT was connected to Base Station Agilent E5515C referred to the Setup Configuration.
b. The RF path losses were compensated into the measurements.
c. A call was established between EUT and Base Station with following setting * :
   i. Call Configs = 5.2B, 5.9B, 5.10B, and 5.13.2B with QPSK
   ii. Set the Gain Factors (β_c and β_d) and parameters (AG Index) were set according to each specific sub-test in the following table, C11.1.3, quoted from the TS 34.121
   iii. Set Cell Power = -86 dBm
   iv. Set Channel Type = 12.2k + HSPA
   v. Set UE Target Power
   vi. Power Ctrl Mode= Alternating bits
   vii. Set and observe the E-TFCI
   viii. Confirm that E-TFCI is equal to the target E-TFCI of 75 for sub-test 1, and other subtest's E-TFCI
d. The transmitted maximum output power was recorded.

Table C.11.1.3: β values for transmitter characteristics tests with HS-DPCCH and E-DCH

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{HS} (Note1)	β_{ec}	β_{ed} (Note 5) (Note 6)	β_{ed} (SF)	β_{ed} (Codes)	CM (dB) (Note 2)	MPR (dB) (Note 2)	AG Index (Note 6)	E-TFCI
1	11/15 (Note 3)	15/15 (Note 3)	64	11/15 (Note 3)	22/15	209/225	1309/225	4	1	1.0	0.0	20	75
2	6/15	15/15	64	6/15	12/15	12/15	94/75	4	1	3.0	2.0	12	67
3	15/15	9/15	64	15/9	30/15	30/15	$\beta_{ed}1$: 47/15 $\beta_{ed}2$: 47/15	4 4	2	2.0	1.0	15	92
4	2/15	15/15	64	2/15	4/15	2/15	56/75	4	1	3.0	2.0	17	71
5	15/15 (Note 4)	15/15 (Note 4)	64	15/15 (Note 4)	30/15	24/15	134/15	4	1	1.0	0.0	21	81

Note 1: Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 30/15 with β_{hs} = 30/15 * β_c .

Note 2: CM = 1 for β_c/β_d =12/15, β_{hs}/β_c=24/15. For all other combinations of DPDCH, DPCCH, HS- DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference.

Note 3: For subtest 1 the β_c/β_d ratio of 11/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to β_c = 10/15 and β_d = 15/15.

Note 4: For subtest 5 the β_c/β_d ratio of 15/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to β_c = 14/15 and β_d = 15/15.

Note 5: In case of testing by UE using E-DPDCH Physical Layer category 1, Sub-test 3 is omitted according to TS25.306 Table 5.1g.

Note 6: β_{ed} can not be set directly, it is set by Absolute Grant Value.

Setup Configuration

DC-HSDPA 3GPP release 8 Setup Configuration:

a. The EUT was connected to Base Station Agilent E5515C referred to the Setup Configuration below
b. The RF path losses were compensated into the measurements.
c. A call was established between EUT and Base Station with following setting:
   i. Set RMC 12.2Kbps + HSDPA mode.
   ii. Set Cell Power = -25 dBm
   iii. Set HS-DSCH Configuration Type to FRC (H-set 12, QPSK)
   iv. Select HSDPA Uplink Parameters
   v. Set Gain Factors (β_c and β_d) and parameters were set according to each Specific sub-test in the following table, C10.1.4, quoted from the TS 34.121
      a). Subtest 1: β_c/β_d=2/15
      b). Subtest 2: β_c/β_d=12/15
      c). Subtest 3: β_c/β_d=15/8
      d). Subtest 4: β_c/β_d=15/4
   vi. Set Delta ACK, Delta NACK and Delta CQI = 8
   vii. Set Ack-Nack Repetition Factor to 3
   viii. Set CQI Feedback Cycle (k) to 4 ms
   ix. Set CQI Repetition Factor to 2
   x. Power Ctrl Mode = All Up bits
d. The transmitted maximum output power was recorded.

The following tests were conducted according to the test requirements outlines in 3GPP TS 34.121 specification.
A summary of these settings are illustrated below:

C.8.1.12 Fixed Reference Channel Definition H-Set 12

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

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

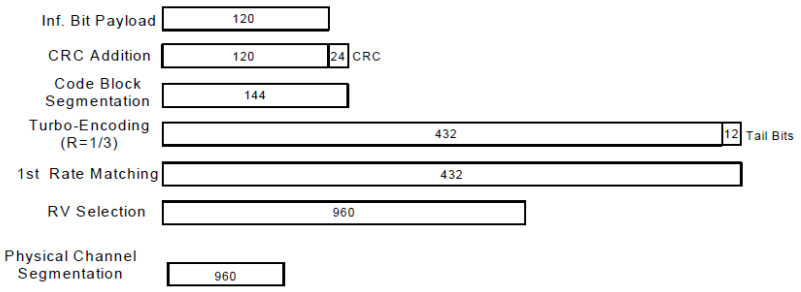


Figure C.8.19: Coding rate for Fixed reference Channel H-Set 12 (QPSK)

Setup Configuration

<WCDMA Conducted Power>

General Note:

1. Per KDB 941225 D01v03r01, for SAR testing is measured using a 12.2 kbps RMC with TPC bits configured to all "1's".
2. Per KDB 941225 D01v03r01, RMC 12.2kbps setting is used to evaluate SAR. If the maximum output power and tune-up tolerance specified for production units in HSDPA / HSUPA / DC-HSDPA is ≤ ¼ dB higher than RMC 12.2Kbps or when the highest reported SAR of the RMC12.2Kbps is scaled by the ratio of specified maximum output power and tune-up tolerance of HSDPA / HSUPA / DC-HSDPA to RMC12.2Kbps and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for HSDPA / HSUPA / DC-HSDPA.

<Default Power Mode>

Band		WCDMA II			Tune-up Limit (dBm)	WCDMA IV			Tune-up Limit (dBm)
TX Channel		9262	9400	9538		1312	1413	1513	
Rx Channel		9662	9800	9938		1537	1638	1738	
Frequency (MHz)		1852.4	1880	1907.6		1712.4	1732.6	1752.6	
3GPP Rel 99	AMR 12.2Kbps	22.72	22.68	22.71	24.00	23.05	22.92	22.93	24.00
3GPP Rel 99	RMC 12.2Kbps	22.74	22.69	22.73	24.00	23.07	22.98	22.94	24.00
3GPP Rel 6	HSDPA Subtest-1	21.68	21.76	21.58	23.00	22.17	22.02	22.12	23.00
3GPP Rel 6	HSDPA Subtest-2	21.75	21.85	21.62	23.00	22.10	21.90	22.05	23.00
3GPP Rel 6	HSDPA Subtest-3	21.25	21.40	21.14	22.50	21.57	21.49	21.59	22.50
3GPP Rel 6	HSDPA Subtest-4	21.27	21.34	21.16	22.50	21.60	21.34	21.65	22.50
3GPP Rel 8	DC-HSDPA Subtest-1	21.85	21.89	21.56	23.00	22.10	21.91	22.01	23.00
3GPP Rel 8	DC-HSDPA Subtest-2	21.83	21.82	21.79	23.00	22.14	21.86	22.13	23.00
3GPP Rel 8	DC-HSDPA Subtest-3	21.39	21.28	21.18	22.50	21.69	21.50	21.54	22.50
3GPP Rel 8	DC-HSDPA Subtest-4	21.38	21.36	21.20	22.50	21.70	21.41	21.50	22.50
3GPP Rel 6	HSUPA Subtest-1	21.92	21.97	21.85	23.00	22.20	22.00	22.01	23.00
3GPP Rel 6	HSUPA Subtest-2	19.91	20.01	19.82	21.00	20.17	19.94	20.01	21.00
3GPP Rel 6	HSUPA Subtest-3	20.94	20.92	20.85	22.00	21.12	20.85	21.08	22.00
3GPP Rel 6	HSUPA Subtest-4	19.94	20.00	19.96	21.00	20.11	19.98	20.00	21.00
3GPP Rel 6	HSUPA Subtest-5	21.97	22.01	21.63	23.00	21.95	21.68	21.83	23.00

<Near-body and Hotspot Mode>

Band		WCDMA II			Tune-up Limit (dBm)	WCDMA IV			Tune-up Limit (dBm)
TX Channel		9262	9400	9538		1312	1413	1513	
Rx Channel		9662	9800	9938		1537	1638	1738	
Frequency (MHz)		1852.4	1880	1907.6		1712.4	1732.6	1752.6	
3GPP Rel 99	AMR 12.2Kbps	22.72	22.68	22.71	24.00	23.05	22.92	22.93	24.00
3GPP Rel 99	RMC 12.2Kbps	22.74	22.69	22.73	24.00	23.07	22.98	22.94	24.00
3GPP Rel 6	HSDPA Subtest-1	21.68	21.76	21.58	23.00	22.17	22.02	22.12	23.00
3GPP Rel 6	HSDPA Subtest-2	21.75	21.85	21.62	23.00	22.10	21.90	22.05	23.00
3GPP Rel 6	HSDPA Subtest-3	21.25	21.40	21.14	22.50	21.57	21.49	21.59	22.50
3GPP Rel 6	HSDPA Subtest-4	21.27	21.34	21.16	22.50	21.60	21.34	21.65	22.50
3GPP Rel 8	DC-HSDPA Subtest-1	21.85	21.89	21.56	23.00	22.10	21.91	22.01	23.00
3GPP Rel 8	DC-HSDPA Subtest-2	21.83	21.82	21.79	23.00	22.14	21.86	22.13	23.00
3GPP Rel 8	DC-HSDPA Subtest-3	21.39	21.28	21.18	22.50	21.69	21.50	21.54	22.50
3GPP Rel 8	DC-HSDPA Subtest-4	21.38	21.36	21.20	22.50	21.70	21.41	21.50	22.50
3GPP Rel 6	HSUPA Subtest-1	21.92	21.97	21.85	23.00	22.20	22.00	22.01	23.00
3GPP Rel 6	HSUPA Subtest-2	19.91	20.01	19.82	21.00	20.17	19.94	20.01	21.00
3GPP Rel 6	HSUPA Subtest-3	20.94	20.92	20.85	22.00	21.12	20.85	21.08	22.00
3GPP Rel 6	HSUPA Subtest-4	19.94	20.00	19.96	21.00	20.11	19.98	20.00	21.00
3GPP Rel 6	HSUPA Subtest-5	21.97	22.01	21.63	23.00	21.95	21.68	21.83	23.00

<LTE Conducted Power>

General Note:

1. Anritsu MT8820C base station simulator was used to setup the connection with EUT; the frequency band, channel bandwidth, RB allocation configuration, modulation type are set in the base station simulator to configure EUT transmitting at maximum power and at different configurations which are requested to be reported to FCC, for conducted power measurement and SAR testing.
2. Per KDB 941225 D05v02r05, when a properly configured base station simulator is used for the SAR and power measurements, spectrum plots for each RB allocation and offset configuration is not required.
3. Per KDB 941225 D05v02r05, start with the largest channel bandwidth and measure SAR for QPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power for RB offsets at the upper edge, middle and lower edge of each required test channel.
4. Per KDB 941225 D05v02r05, 50% RB allocation for QPSK SAR testing follows 1RB QPSK allocation procedure.
5. Per KDB 941225 D05v02r05, For QPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations and the highest reported SAR for 1 RB and 50% RB allocation are ≤ 0.8 W/kg. Otherwise, SAR is measured for the highest output power channel; and if the reported SAR is > 1.45 W/kg, the remaining required test channels must also be tested.
6. Per KDB 941225 D05v02r05, 16QAM output power for each RB allocation configuration is > not ½ dB higher than the same configuration in QPSK and the reported SAR for the QPSK configuration is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, 16QAM SAR testing is not required.
7. Per KDB 941225 D05v02r05, Smaller bandwidth output power for each RB allocation configuration is > not ½ dB higher than the same configuration in the largest supported bandwidth, and the reported SAR for the largest supported bandwidth is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, smaller bandwidth SAR testing is not required.
8. For LTE B4 / B12 the maximum bandwidth does not support three non-overlapping channels, per KDB 941225 D05v02r05, 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.
9. LTE Band17/38 SAR test was covered by Band12/41, according to April 2015 TCB workshop, SAR test for overlapping LTE bands can be reduced if
    a. the maximum output power, including tolerance, for the smaller band is ≤ the larger band to qualify for the SAR test exclusion
    b. the channel bandwidth and other operating parameters for the smaller band are fully supported by the larger band

<Default Power Mode>

<LTE Band 2>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				18700	18900	19100		
Frequency (MHz)				1860	1880	1900		
20	QPSK	1	0	22.58	22.61	22.51	24	0
20	QPSK	1	49	22.60	22.74	22.71		
20	QPSK	1	99	22.33	22.24	22.05		
20	QPSK	50	0	21.75	21.79	21.56	23	1
20	QPSK	50	24	21.69	21.78	21.42		
20	QPSK	50	50	21.70	21.63	21.37		
20	QPSK	100	0	21.66	21.79	21.47		
20	16QAM	1	0	21.51	21.54	21.42	23	1
20	16QAM	1	49	21.50	21.64	21.32		
20	16QAM	1	99	21.34	21.28	21.13		
20	16QAM	50	0	20.70	20.75	20.50	22	2
20	16QAM	50	24	20.75	20.76	20.45		
20	16QAM	50	50	20.70	20.64	20.43		
20	16QAM	100	0	20.67	20.73	20.48		
Channel				18675	18900	19125	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1857.5	1880	1902.5		
15	QPSK	1	0	22.66	22.81	22.50	24	0
15	QPSK	1	37	22.79	22.98	22.93		
15	QPSK	1	74	22.69	22.55	22.23		
15	QPSK	36	0	21.75	21.73	21.63	23	1
15	QPSK	36	20	21.72	21.82	21.49		
15	QPSK	36	39	21.73	21.75	21.33		
15	QPSK	75	0	21.74	21.85	21.50		
15	16QAM	1	0	21.61	21.63	21.40	23	1
15	16QAM	1	37	21.57	21.64	21.18		
15	16QAM	1	74	21.49	21.45	21.25		
15	16QAM	36	0	20.64	20.79	20.58	22	2
15	16QAM	36	20	20.70	20.78	20.49		
15	16QAM	36	39	20.67	20.62	20.35		
15	16QAM	75	0	20.80	20.73	20.58		
Channel				18650	18900	19150	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1855	1880	1905		
10	QPSK	1	0	22.69	22.79	22.36	24	0
10	QPSK	1	25	22.66	22.77	22.38		
10	QPSK	1	49	22.62	22.33	22.14		
10	QPSK	25	0	21.74	21.84	21.47	23	1
10	QPSK	25	12	21.78	21.80	21.40		
10	QPSK	25	25	21.73	21.83	21.30		
10	QPSK	50	0	21.75	21.90	21.49		
10	16QAM	1	0	21.54	21.64	21.35	23	1
10	16QAM	1	25	21.80	21.77	21.46		
10	16QAM	1	49	21.49	21.22	21.13		
10	16QAM	25	0	20.82	20.73	20.63	22	2
10	16QAM	25	12	20.75	20.78	20.60		
10	16QAM	25	25	20.73	20.79	20.39		
10	16QAM	50	0	20.73	20.89	20.48		

Channel				18625	18900	19175	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1852.5	1880	1907.5		
5	QPSK	1	0	22.44	22.68	22.13	24	0
5	QPSK	1	12	22.93	22.89	22.68		
5	QPSK	1	24	22.50	22.61	22.20		
5	QPSK	12	0	21.70	21.80	21.35	23	1
5	QPSK	12	7	21.72	21.87	21.36		
5	QPSK	12	13	21.64	21.80	21.25		
5	QPSK	25	0	21.67	21.85	21.31		
5	16QAM	1	0	21.50	21.60	21.42	23	1
5	16QAM	1	12	21.43	21.61	21.64		
5	16QAM	1	24	21.43	21.57	21.11		
5	16QAM	12	0	20.48	20.75	20.52	22	2
5	16QAM	12	7	20.68	20.72	20.56		
5	16QAM	12	13	20.61	20.79	20.35		
5	16QAM	25	0	20.66	20.72	20.21		
Channel				18615	18900	19185	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1851.5	1880	1908.5		
3	QPSK	1	0	22.56	22.63	22.35	24	0
3	QPSK	1	8	22.50	22.69	22.15		
3	QPSK	1	14	22.57	22.80	22.07		
3	QPSK	8	0	21.69	21.85	21.37	23	1
3	QPSK	8	4	21.71	21.84	21.35		
3	QPSK	8	7	21.69	21.87	21.35		
3	QPSK	15	0	21.71	21.83	21.39		
3	16QAM	1	0	21.52	21.57	21.16	23	1
3	16QAM	1	8	21.46	21.53	21.09		
3	16QAM	1	14	21.52	21.56	21.17		
3	16QAM	8	0	20.67	20.82	20.42	22	2
3	16QAM	8	4	20.65	20.85	20.29		
3	16QAM	8	7	20.68	20.76	20.37		
3	16QAM	15	0	20.55	20.66	20.32		
Channel				18607	18900	19193	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1850.7	1880	1909.3		
1.4	QPSK	1	0	22.41	22.76	22.26	24	0
1.4	QPSK	1	3	22.48	22.76	22.28		
1.4	QPSK	1	5	22.34	22.53	22.12		
1.4	QPSK	3	0	22.70	22.77	22.38		
1.4	QPSK	3	1	22.66	22.91	22.55		
1.4	QPSK	3	3	22.81	22.76	22.34		
1.4	QPSK	6	0	21.76	21.80	21.26	23	1
1.4	16QAM	1	0	21.55	21.65	21.22	23	1
1.4	16QAM	1	3	21.68	21.83	21.43		
1.4	16QAM	1	5	21.51	21.63	21.26		
1.4	16QAM	3	0	21.72	21.82	21.38		
1.4	16QAM	3	1	21.75	21.82	21.33		
1.4	16QAM	3	3	21.75	21.85	21.36		
1.4	16QAM	6	0	20.45	20.77	20.52	22	2

<LTE Band 4>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				20050	20175	20300		
Frequency (MHz)				1720	1732.5	1745		
20	QPSK	1	0	22.41	22.47	22.49	24	0
20	QPSK	1	49	22.62	22.99	22.53		
20	QPSK	1	99	22.04	22.11	22.08		
20	QPSK	50	0	21.53	21.69	21.65	23	1
20	QPSK	50	24	21.51	21.50	21.53		
20	QPSK	50	50	21.44	21.33	21.51		
20	QPSK	100	0	21.51	21.57	21.54		
20	16QAM	1	0	21.41	21.45	21.43	23	1
20	16QAM	1	49	21.44	21.29	21.35		
20	16QAM	1	99	21.22	21.26	21.21		
20	16QAM	50	0	20.75	20.53	20.76	22	2
20	16QAM	50	24	20.59	20.48	20.59		
20	16QAM	50	50	20.53	20.40	20.59		
20	16QAM	100	0	20.54	20.44	20.50		
Channel				20025	20175	20325	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1717.5	1732.5	1747.5		
15	QPSK	1	0	22.64	22.42	22.57	24	0
15	QPSK	1	37	22.61	22.78	22.52		
15	QPSK	1	74	22.43	22.34	22.35		
15	QPSK	36	0	21.68	21.58	21.62	23	1
15	QPSK	36	20	21.68	21.56	21.65		
15	QPSK	36	39	21.62	21.46	21.47		
15	QPSK	75	0	21.56	21.58	21.58		
15	16QAM	1	0	21.41	21.52	21.48	23	1
15	16QAM	1	37	21.38	21.35	21.30		
15	16QAM	1	74	21.30	21.23	21.27		
15	16QAM	36	0	20.71	20.57	20.58	22	2
15	16QAM	36	20	20.64	20.56	20.63		
15	16QAM	36	39	20.63	20.54	20.45		
15	16QAM	75	0	20.63	20.57	20.66		
Channel				20000	20175	20350	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1715	1732.5	1750		
10	QPSK	1	0	22.56	22.37	22.64	24	0
10	QPSK	1	25	22.64	22.78	22.77		
10	QPSK	1	49	22.35	22.17	22.27		
10	QPSK	25	0	21.71	21.55	21.65	23	1
10	QPSK	25	12	21.66	21.55	21.66		
10	QPSK	25	25	21.67	21.59	21.47		
10	QPSK	50	0	21.70	21.60	21.58		
10	16QAM	1	0	21.49	21.32	21.43	23	1
10	16QAM	1	25	21.61	21.69	21.52		
10	16QAM	1	49	21.40	21.22	21.31		
10	16QAM	25	0	20.76	20.71	20.72	22	2
10	16QAM	25	12	20.92	20.72	20.71		
10	16QAM	25	25	20.85	20.68	20.58		
10	16QAM	50	0	20.78	20.63	20.49		

Channel				19975	20175	20375	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1712.5	1732.5	1752.5		
5	QPSK	1	0	22.30	22.38	22.45	24	0
5	QPSK	1	12	22.69	22.80	22.52		
5	QPSK	1	24	22.38	22.17	22.18		
5	QPSK	12	0	21.66	21.58	21.56	23	1
5	QPSK	12	7	21.64	21.64	21.53		
5	QPSK	12	13	21.70	21.56	21.50		
5	QPSK	25	0	21.64	21.59	21.54		
5	16QAM	1	0	21.43	21.35	21.41	23	1
5	16QAM	1	12	21.59	21.64	21.32		
5	16QAM	1	24	21.17	21.32	21.22		
5	16QAM	12	0	20.60	20.57	20.58	22	2
5	16QAM	12	7	20.71	20.46	20.35		
5	16QAM	12	13	20.59	20.56	20.54		
5	16QAM	25	0	20.70	20.77	20.59		
Channel				19965	20175	20385	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1711.5	1732.5	1753.5		
3	QPSK	1	0	22.44	22.46	22.39	24	0
3	QPSK	1	8	22.33	22.33	22.26		
3	QPSK	1	14	22.40	22.47	22.06		
3	QPSK	8	0	21.68	21.61	21.58	23	1
3	QPSK	8	4	21.68	21.66	21.41		
3	QPSK	8	7	21.71	21.58	21.38		
3	QPSK	15	0	21.67	21.59	21.46		
3	16QAM	1	0	21.48	21.43	21.55	23	1
3	16QAM	1	8	21.40	21.66	21.05		
3	16QAM	1	14	21.35	21.41	21.04		
3	16QAM	8	0	20.65	20.65	20.43	22	2
3	16QAM	8	4	20.80	20.58	20.53		
3	16QAM	8	7	20.56	20.74	20.36		
3	16QAM	15	0	20.56	20.52	20.23		
Channel				19957	20175	20393	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1710.7	1732.5	1754.3		
1.4	QPSK	1	0	22.55	22.45	22.35	24	0
1.4	QPSK	1	3	22.69	22.49	22.31		
1.4	QPSK	1	5	22.51	22.42	22.16		
1.4	QPSK	3	0	22.60	22.56	22.44		
1.4	QPSK	3	1	22.68	22.73	22.46		
1.4	QPSK	3	3	22.58	22.53	22.38		
1.4	QPSK	6	0	21.50	21.49	21.29	23	1
1.4	16QAM	1	0	21.41	21.23	21.26	23	1
1.4	16QAM	1	3	21.51	21.51	21.28		
1.4	16QAM	1	5	21.57	21.70	21.26		
1.4	16QAM	3	0	21.63	21.48	21.44		
1.4	16QAM	3	1	21.61	21.40	21.46		
1.4	16QAM	3	3	21.56	21.11	21.30		
1.4	16QAM	6	0	20.43	20.26	20.35	22	2

<LTE Band 12>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				23060	23095	23130		
Frequency (MHz)				704	707.5	711		
10	QPSK	1	0	22.63	22.62	22.51	24	0
10	QPSK	1	25	23.16	22.94	22.96		
10	QPSK	1	49	23.00	22.90	22.59		
10	QPSK	25	0	21.96	21.94	21.90	23	1
10	QPSK	25	12	21.92	21.90	21.88		
10	QPSK	25	25	21.83	21.90	21.82		
10	QPSK	50	0	21.94	21.91	21.92		
10	16QAM	1	0	21.50	21.45	21.53	23	1
10	16QAM	1	25	21.96	21.85	21.92		
10	16QAM	1	49	21.62	21.69	21.53		
10	16QAM	25	0	20.76	20.87	20.93	22	2
10	16QAM	25	12	20.78	21.08	21.01		
10	16QAM	25	25	20.74	20.88	20.78		
10	16QAM	50	0	20.84	20.87	20.92		
Channel				23035	23095	23155	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				701.5	707.5	713.5		
5	QPSK	1	0	22.45	22.51	22.68	24	0
5	QPSK	1	12	23.14	23.08	22.65		
5	QPSK	1	24	22.47	22.63	22.26		
5	QPSK	12	0	21.75	21.77	21.77	23	1
5	QPSK	12	7	21.84	21.95	21.74		
5	QPSK	12	13	21.86	21.88	21.75		
5	QPSK	25	0	21.81	21.94	21.78		
5	16QAM	1	0	21.61	21.38	21.55	23	1
5	16QAM	1	12	21.94	21.54	21.50		
5	16QAM	1	24	21.68	21.58	21.47		
5	16QAM	12	0	20.70	20.86	20.63	22	2
5	16QAM	12	7	20.79	20.87	20.61		
5	16QAM	12	13	20.81	20.97	20.52		
5	16QAM	25	0	20.96	20.86	20.65		
Channel				23025	23095	23165	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				700.5	707.5	714.5		
3	QPSK	1	0	22.86	22.78	22.62	24	0
3	QPSK	1	8	22.80	22.68	22.46		
3	QPSK	1	14	22.77	22.71	22.40		
3	QPSK	8	0	21.84	21.82	21.81	23	1
3	QPSK	8	4	21.90	21.87	21.88		
3	QPSK	8	7	21.90	21.83	21.82		
3	QPSK	15	0	21.80	21.86	21.80		
3	16QAM	1	0	21.66	21.66	21.45	23	1
3	16QAM	1	8	21.59	21.57	21.56		
3	16QAM	1	14	21.65	21.69	21.58		
3	16QAM	8	0	20.91	20.90	20.75	22	2
3	16QAM	8	4	20.81	20.95	20.75		
3	16QAM	8	7	20.88	21.00	20.82		
3	16QAM	15	0	20.56	20.89	20.87		

Channel				23017	23095	23173	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				699.7	707.5	715.3		
1.4	QPSK	1	0	22.76	22.75	22.67	24	0
1.4	QPSK	1	3	22.80	22.74	22.79		
1.4	QPSK	1	5	22.73	22.77	22.73		
1.4	QPSK	3	0	23.00	22.71	22.77		
1.4	QPSK	3	1	22.86	22.88	22.82		
1.4	QPSK	3	3	22.84	22.83	22.80		
1.4	QPSK	6	0	21.83	21.78	21.73	23	1
1.4	16QAM	1	0	21.57	21.65	21.62	23	1
1.4	16QAM	1	3	21.81	21.82	21.80		
1.4	16QAM	1	5	21.50	21.57	21.58		
1.4	16QAM	3	0	21.86	21.85	21.76		
1.4	16QAM	3	1	21.76	21.87	21.80		
1.4	16QAM	3	3	22.05	21.86	21.78		
1.4	16QAM	6	0	20.59	20.69	20.62	22	2

<LTE Band 17>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				23780	23790	23800		
Frequency (MHz)				709	710	711		
10	QPSK	1	0	22.66	22.60	22.54	24	0
10	QPSK	1	25	22.93	22.84	22.68		
10	QPSK	1	49	22.59	22.75	22.43		
10	QPSK	25	0	21.88	21.82	21.80	23	1
10	QPSK	25	12	21.87	21.80	21.78		
10	QPSK	25	25	21.86	21.78	21.78		
10	QPSK	50	0	21.88	21.84	21.79		
10	16QAM	1	0	21.31	21.36	21.45	23	1
10	16QAM	1	25	21.81	21.74	21.79		
10	16QAM	1	49	21.67	21.50	21.57		
10	16QAM	25	0	20.89	20.91	20.94	22	2
10	16QAM	25	12	20.99	20.79	20.73		
10	16QAM	25	25	20.82	20.82	20.88		
10	16QAM	50	0	20.96	20.91	20.80		
Channel				23755	23790	23825	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				706.5	710	713.5		
5	QPSK	1	0	22.59	22.35	22.39	24	0
5	QPSK	1	12	22.98	23.06	22.83		
5	QPSK	1	24	22.81	22.37	22.28		
5	QPSK	12	0	21.73	21.81	21.79	23	1
5	QPSK	12	7	21.83	21.83	21.74		
5	QPSK	12	13	21.76	21.76	21.67		
5	QPSK	25	0	21.75	21.81	21.69		
5	16QAM	1	0	21.47	21.43	21.44	23	1
5	16QAM	1	12	21.48	21.49	21.40		
5	16QAM	1	24	21.48	21.50	21.44		
5	16QAM	12	0	20.67	20.75	20.67	22	2
5	16QAM	12	7	20.86	20.70	20.63		
5	16QAM	12	13	20.79	20.91	20.53		
5	16QAM	25	0	20.82	20.85	20.66		

<Near-body and Hotspot Mode>

<LTE Band 2>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				18700	18900	19100		
Frequency (MHz)				1860	1880	1900		
20	QPSK	1	0	22.58	22.61	22.51	24	0
20	QPSK	1	49	22.60	22.74	22.71		
20	QPSK	1	99	22.33	22.24	22.05		
20	QPSK	50	0	21.75	21.79	21.56	23	1
20	QPSK	50	24	21.69	21.78	21.42		
20	QPSK	50	50	21.70	21.63	21.37		
20	QPSK	100	0	21.66	21.79	21.47		
20	16QAM	1	0	21.51	21.54	21.42	23	1
20	16QAM	1	49	21.50	21.64	21.32		
20	16QAM	1	99	21.34	21.28	21.13		
20	16QAM	50	0	20.70	20.75	20.50	22	2
20	16QAM	50	24	20.75	20.76	20.45		
20	16QAM	50	50	20.70	20.64	20.43		
20	16QAM	100	0	20.67	20.73	20.48		
Channel				18675	18900	19125	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1857.5	1880	1902.5		
15	QPSK	1	0	22.66	22.81	22.50	24	0
15	QPSK	1	37	22.79	22.98	22.93		
15	QPSK	1	74	22.69	22.55	22.23		
15	QPSK	36	0	21.75	21.73	21.63	23	1
15	QPSK	36	20	21.72	21.82	21.49		
15	QPSK	36	39	21.73	21.75	21.33		
15	QPSK	75	0	21.74	21.85	21.50		
15	16QAM	1	0	21.61	21.63	21.40	23	1
15	16QAM	1	37	21.57	21.64	21.18		
15	16QAM	1	74	21.49	21.45	21.25		
15	16QAM	36	0	20.64	20.79	20.58	22	2
15	16QAM	36	20	20.70	20.78	20.49		
15	16QAM	36	39	20.67	20.62	20.35		
15	16QAM	75	0	20.80	20.73	20.58		
Channel				18650	18900	19150	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1855	1880	1905		
10	QPSK	1	0	22.69	22.79	22.36	24	0
10	QPSK	1	25	22.66	22.77	22.38		
10	QPSK	1	49	22.62	22.33	22.14		
10	QPSK	25	0	21.74	21.84	21.47	23	1
10	QPSK	25	12	21.78	21.80	21.40		
10	QPSK	25	25	21.73	21.83	21.30		
10	QPSK	50	0	21.75	21.90	21.49		
10	16QAM	1	0	21.54	21.64	21.35	23	1
10	16QAM	1	25	21.80	21.77	21.46		
10	16QAM	1	49	21.49	21.22	21.13		
10	16QAM	25	0	20.82	20.73	20.63	22	2
10	16QAM	25	12	20.75	20.78	20.60		
10	16QAM	25	25	20.73	20.79	20.39		
10	16QAM	50	0	20.73	20.89	20.48		

Channel				18625	18900	19175	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1852.5	1880	1907.5		
5	QPSK	1	0	22.44	22.68	22.13	24	0
5	QPSK	1	12	22.93	22.89	22.68		
5	QPSK	1	24	22.50	22.61	22.20		
5	QPSK	12	0	21.70	21.80	21.35	23	1
5	QPSK	12	7	21.72	21.87	21.36		
5	QPSK	12	13	21.64	21.80	21.25		
5	QPSK	25	0	21.67	21.85	21.31		
5	16QAM	1	0	21.50	21.60	21.42	23	1
5	16QAM	1	12	21.43	21.61	21.64		
5	16QAM	1	24	21.43	21.57	21.11		
5	16QAM	12	0	20.48	20.75	20.52	22	2
5	16QAM	12	7	20.68	20.72	20.56		
5	16QAM	12	13	20.61	20.79	20.35		
5	16QAM	25	0	20.66	20.72	20.21		
Channel				18615	18900	19185	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1851.5	1880	1908.5		
3	QPSK	1	0	22.56	22.63	22.35	24	0
3	QPSK	1	8	22.50	22.69	22.15		
3	QPSK	1	14	22.57	22.80	22.07		
3	QPSK	8	0	21.69	21.85	21.37	23	1
3	QPSK	8	4	21.71	21.84	21.35		
3	QPSK	8	7	21.69	21.87	21.35		
3	QPSK	15	0	21.71	21.83	21.39		
3	16QAM	1	0	21.52	21.57	21.16	23	1
3	16QAM	1	8	21.46	21.53	21.09		
3	16QAM	1	14	21.52	21.56	21.17		
3	16QAM	8	0	20.67	20.82	20.42	22	2
3	16QAM	8	4	20.65	20.85	20.29		
3	16QAM	8	7	20.68	20.76	20.37		
3	16QAM	15	0	20.55	20.66	20.32		
Channel				18607	18900	19193	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1850.7	1880	1909.3		
1.4	QPSK	1	0	22.41	22.76	22.26	24	0
1.4	QPSK	1	3	22.48	22.76	22.28		
1.4	QPSK	1	5	22.34	22.53	22.12		
1.4	QPSK	3	0	22.70	22.77	22.38		
1.4	QPSK	3	1	22.66	22.91	22.55		
1.4	QPSK	3	3	22.81	22.76	22.34		
1.4	QPSK	6	0	21.76	21.80	21.26	23	1
1.4	16QAM	1	0	21.55	21.65	21.22	23	1
1.4	16QAM	1	3	21.68	21.83	21.43		
1.4	16QAM	1	5	21.51	21.63	21.26		
1.4	16QAM	3	0	21.72	21.82	21.38		
1.4	16QAM	3	1	21.75	21.82	21.33		
1.4	16QAM	3	3	21.75	21.85	21.36		
1.4	16QAM	6	0	20.45	20.77	20.52	22	2

<LTE Band 4>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				20050	20175	20300		
Frequency (MHz)				1720	1732.5	1745		
20	QPSK	1	0	22.41	22.47	22.49	24	0
20	QPSK	1	49	22.62	22.99	22.53		
20	QPSK	1	99	22.04	22.11	22.08		
20	QPSK	50	0	21.53	21.69	21.65	23	1
20	QPSK	50	24	21.51	21.50	21.53		
20	QPSK	50	50	21.44	21.33	21.51		
20	QPSK	100	0	21.51	21.57	21.54		
20	16QAM	1	0	21.41	21.45	21.43	23	1
20	16QAM	1	49	21.44	21.29	21.35		
20	16QAM	1	99	21.22	21.26	21.21		
20	16QAM	50	0	20.75	20.53	20.76	22	2
20	16QAM	50	24	20.59	20.48	20.59		
20	16QAM	50	50	20.53	20.40	20.59		
20	16QAM	100	0	20.54	20.44	20.50		
Channel				20025	20175	20325	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1717.5	1732.5	1747.5		
15	QPSK	1	0	22.64	22.42	22.57	24	0
15	QPSK	1	37	22.61	22.78	22.52		
15	QPSK	1	74	22.43	22.34	22.35		
15	QPSK	36	0	21.68	21.58	21.62	23	1
15	QPSK	36	20	21.68	21.56	21.65		
15	QPSK	36	39	21.62	21.46	21.47		
15	QPSK	75	0	21.56	21.58	21.58		
15	16QAM	1	0	21.41	21.52	21.48	23	1
15	16QAM	1	37	21.38	21.35	21.30		
15	16QAM	1	74	21.30	21.23	21.27		
15	16QAM	36	0	20.71	20.57	20.58	22	2
15	16QAM	36	20	20.64	20.56	20.63		
15	16QAM	36	39	20.63	20.54	20.45		
15	16QAM	75	0	20.63	20.57	20.66		
Channel				20000	20175	20350	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1715	1732.5	1750		
10	QPSK	1	0	22.56	22.37	22.64	24	0
10	QPSK	1	25	22.64	22.78	22.77		
10	QPSK	1	49	22.35	22.17	22.27		
10	QPSK	25	0	21.71	21.55	21.65	23	1
10	QPSK	25	12	21.66	21.55	21.66		
10	QPSK	25	25	21.67	21.59	21.47		
10	QPSK	50	0	21.70	21.60	21.58		
10	16QAM	1	0	21.49	21.32	21.43	23	1
10	16QAM	1	25	21.61	21.69	21.52		
10	16QAM	1	49	21.40	21.22	21.31		
10	16QAM	25	0	20.76	20.71	20.72	22	2
10	16QAM	25	12	20.92	20.72	20.71		
10	16QAM	25	25	20.85	20.68	20.58		
10	16QAM	50	0	20.78	20.63	20.49		

Channel				19975	20175	20375	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1712.5	1732.5	1752.5		
5	QPSK	1	0	22.30	22.38	22.45	24	0
5	QPSK	1	12	22.69	22.80	22.52		
5	QPSK	1	24	22.38	22.17	22.18		
5	QPSK	12	0	21.66	21.58	21.56	23	1
5	QPSK	12	7	21.64	21.64	21.53		
5	QPSK	12	13	21.70	21.56	21.50		
5	QPSK	25	0	21.64	21.59	21.54		
5	16QAM	1	0	21.43	21.35	21.41	23	1
5	16QAM	1	12	21.59	21.64	21.32		
5	16QAM	1	24	21.17	21.32	21.22		
5	16QAM	12	0	20.60	20.57	20.58	22	2
5	16QAM	12	7	20.71	20.46	20.35		
5	16QAM	12	13	20.59	20.56	20.54		
5	16QAM	25	0	20.70	20.77	20.59		
Channel				19965	20175	20385	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1711.5	1732.5	1753.5		
3	QPSK	1	0	22.44	22.46	22.39	24	0
3	QPSK	1	8	22.33	22.33	22.26		
3	QPSK	1	14	22.40	22.47	22.06		
3	QPSK	8	0	21.68	21.61	21.58	23	1
3	QPSK	8	4	21.68	21.66	21.41		
3	QPSK	8	7	21.71	21.58	21.38		
3	QPSK	15	0	21.67	21.59	21.46		
3	16QAM	1	0	21.48	21.43	21.55	23	1
3	16QAM	1	8	21.40	21.66	21.05		
3	16QAM	1	14	21.35	21.41	21.04		
3	16QAM	8	0	20.65	20.65	20.43	22	2
3	16QAM	8	4	20.80	20.58	20.53		
3	16QAM	8	7	20.56	20.74	20.36		
3	16QAM	15	0	20.56	20.52	20.23		
Channel				19957	20175	20393	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1710.7	1732.5	1754.3		
1.4	QPSK	1	0	22.55	22.45	22.35	24	0
1.4	QPSK	1	3	22.69	22.49	22.31		
1.4	QPSK	1	5	22.51	22.42	22.16		
1.4	QPSK	3	0	22.60	22.56	22.44		
1.4	QPSK	3	1	22.68	22.73	22.46		
1.4	QPSK	3	3	22.58	22.53	22.38		
1.4	QPSK	6	0	21.50	21.49	21.29	23	1
1.4	16QAM	1	0	21.41	21.23	21.26	23	1
1.4	16QAM	1	3	21.51	21.51	21.28		
1.4	16QAM	1	5	21.57	21.70	21.26		
1.4	16QAM	3	0	21.63	21.48	21.44		
1.4	16QAM	3	1	21.61	21.40	21.46		
1.4	16QAM	3	3	21.56	21.11	21.30		
1.4	16QAM	6	0	20.43	20.26	20.35	22	2

<LTE Band 12>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				23060	23095	23130		
Frequency (MHz)				704	707.5	711		
10	QPSK	1	0	21.56	21.60	21.56	23	0
10	QPSK	1	25	21.39	21.16	21.38		
10	QPSK	1	49	21.55	21.33	21.25		
10	QPSK	25	0	21.85	21.88	21.87	22	1
10	QPSK	25	12	21.82	21.50	21.83		
10	QPSK	25	25	21.84	21.82	21.82		
10	QPSK	50	0	21.85	21.87	21.86		
10	16QAM	1	0	21.30	21.24	21.66	22	1
10	16QAM	1	25	21.56	21.44	21.65		
10	16QAM	1	49	21.51	21.36	21.49		
10	16QAM	25	0	20.70	20.77	20.98	21	2
10	16QAM	25	12	20.85	20.85	20.83		
10	16QAM	25	25	20.92	20.85	20.74		
10	16QAM	50	0	20.85	20.85	20.82		
Channel				23035	23095	23155	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				701.5	707.5	713.5		
5	QPSK	1	0	21.38	21.33	21.64	23	0
5	QPSK	1	12	21.58	21.61	21.73		
5	QPSK	1	24	21.46	21.54	21.32		
5	QPSK	12	0	21.78	21.71	21.80	22	1
5	QPSK	12	7	21.90	21.83	21.74		
5	QPSK	12	13	21.76	21.83	21.69		
5	QPSK	25	0	21.73	21.76	21.66		
5	16QAM	1	0	21.54	21.37	21.49	22	1
5	16QAM	1	12	21.48	21.83	21.47		
5	16QAM	1	24	21.54	21.51	21.44		
5	16QAM	12	0	20.67	20.58	20.73	21	2
5	16QAM	12	7	20.84	20.95	20.81		
5	16QAM	12	13	20.80	20.94	20.64		
5	16QAM	25	0	20.92	20.78	20.80		
Channel				23025	23095	23165	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				700.5	707.5	714.5		
3	QPSK	1	0	21.51	21.79	21.65	23	0
3	QPSK	1	8	21.84	22.11	21.81		
3	QPSK	1	14	21.71	21.69	21.37		
3	QPSK	8	0	21.96	21.91	21.83	22	1
3	QPSK	8	4	21.84	21.85	21.81		
3	QPSK	8	7	21.84	21.79	21.83		
3	QPSK	15	0	21.74	21.85	21.73		
3	16QAM	1	0	21.60	21.65	21.60	22	1
3	16QAM	1	8	21.48	21.52	21.46		
3	16QAM	1	14	21.56	21.66	21.53		
3	16QAM	8	0	20.89	20.81	20.84	21	2
3	16QAM	8	4	20.93	20.98	20.81		
3	16QAM	8	7	20.92	20.92	20.85		
3	16QAM	15	0	20.79	20.78	20.78		

Channel				23017	23095	23173	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				699.7	707.5	715.3		
1.4	QPSK	1	0	21.76	21.82	21.75	23	0
1.4	QPSK	1	3	21.78	21.91	21.85		
1.4	QPSK	1	5	21.82	21.90	21.80		
1.4	QPSK	3	0	21.86	21.96	21.84		
1.4	QPSK	3	1	21.85	22.01	21.82		
1.4	QPSK	3	3	21.81	21.83	21.72		
1.4	QPSK	6	0	21.83	21.77	21.80	22	1
1.4	16QAM	1	0	21.65	21.62	21.69	22	1
1.4	16QAM	1	3	21.58	21.59	21.60		
1.4	16QAM	1	5	21.66	21.62	21.63		
1.4	16QAM	3	0	21.84	21.83	21.77		
1.4	16QAM	3	1	21.98	21.83	21.72		
1.4	16QAM	3	3	21.88	21.93	22.00		
1.4	16QAM	6	0	20.81	20.63	20.78	21	2

<LTE Band 17>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				23780	23790	23800		
Frequency (MHz)				709	710	711		
10	QPSK	1	0	21.06	20.92	21.02	22.5	0
10	QPSK	1	25	20.70	20.68	20.63		
10	QPSK	1	49	20.65	20.91	21.01		
10	QPSK	25	0	20.89	21.16	21.13	21.5	1
10	QPSK	25	12	21.27	21.26	21.21		
10	QPSK	25	25	21.31	21.27	21.22		
10	QPSK	50	0	21.33	21.28	21.26		
10	16QAM	1	0	20.84	20.82	20.72	21.5	1
10	16QAM	1	25	20.94	21.03	20.84		
10	16QAM	1	49	21.01	20.98	20.92		
10	16QAM	25	0	20.49	20.38	20.40	20.5	2
10	16QAM	25	12	20.42	20.36	20.39		
10	16QAM	25	25	20.41	20.40	20.38		
10	16QAM	50	0	20.49	20.43	20.35		
Channel				23755	23790	23825	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				706.5	710	713.5		
5	QPSK	1	0	20.98	20.71	21.03	22.5	0
5	QPSK	1	12	20.88	21.31	21.28		
5	QPSK	1	24	20.93	21.03	20.84		
5	QPSK	12	0	21.09	21.19	21.22	21.5	1
5	QPSK	12	7	21.26	21.26	21.23		
5	QPSK	12	13	21.21	21.21	21.22		
5	QPSK	25	0	21.16	21.21	21.15		
5	16QAM	1	0	20.89	20.87	20.93	21.5	1
5	16QAM	1	12	20.89	20.94	20.90		
5	16QAM	1	24	20.90	20.97	20.88		
5	16QAM	12	0	20.26	20.18	20.24	20.5	2
5	16QAM	12	7	20.40	20.46	20.24		
5	16QAM	12	13	20.22	20.49	20.25		
5	16QAM	25	0	20.44	20.29	20.21		

<TDD LTE SAR Measurement>

TDD LTE configuration setup for SAR measurement

SAR was tested with a fixed periodic duty factor according to the highest transmission duty factor implemented for the device and supported by 3GPP.

a. 3GPP TS 36.211 section 4.2 for Type 2 Frame Structure and Table 4.2-2 for uplink-downlink configurations
b. "special subframe S" contains both uplink and downlink transmissions, it has been taken into consideration to determine the transmission duty factor according to the worst case uplink and downlink cyclic prefix requirements for UpPTS
c. Establishing connections with base station simulators ensure a consistent means for testing SAR and recommended for evaluating SAR. The Anritsu MT8820C (firmware: #22.52#004) was used for LTE output power measurements and SAR testing.

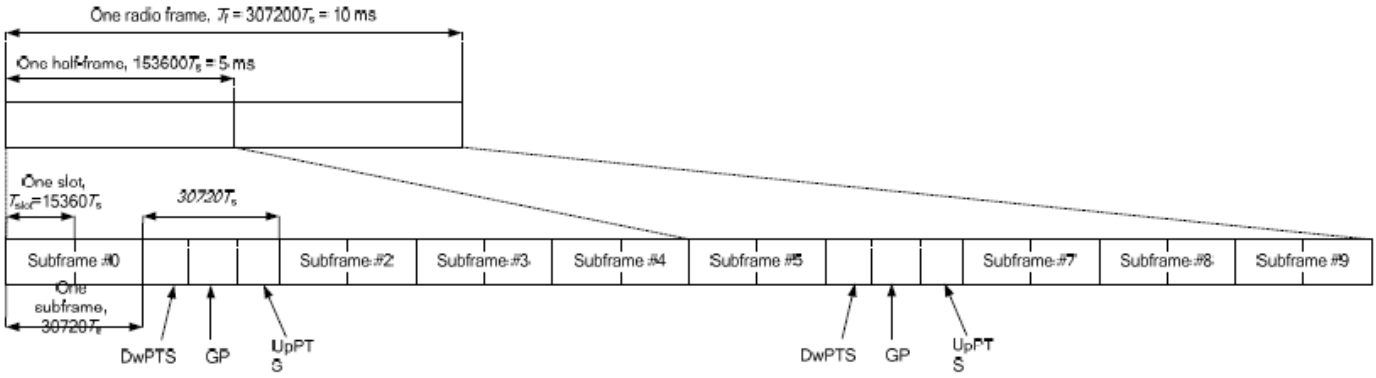


Figure 4.2-1: Frame structure type 2 (for 5 ms switch-point periodicity).

Table 4.2-2: Uplink-downlink configurations.

Uplink-downlink configuration	Downlink-to-Uplink Switch-point periodicity	Subframe number									
		0	1	2	3	4	5	6	7	8	9
0	5 ms	D	S	U	U	U	D	S	U	U	U
1	5 ms	D	S	U	U	D	D	S	U	U	D
2	5 ms	D	S	U	D	D	D	S	U	D	D
3	10 ms	D	S	U	U	U	D	D	D	D	D
4	10 ms	D	S	U	U	D	D	D	D	D	D
5	10 ms	D	S	U	D	D	D	D	D	D	D
6	5 ms	D	S	U	U	U	D	S	U	U	D

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

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

Special subframe (30720·T_s): Normal cyclic prefix in downlink (UpPTS)			
	Special subframe configuration	**Normal cyclic prefix in uplink**	**Extended cyclic prefix in uplink**
Uplink duty factor in one special subframe	**0~4**	7.13%	8.33%
	5~9	14.3%	16.7%

Special subframe(30720·T_s): Extended cyclic prefix in downlink (UpPTS)			
	Special subframe configuration	**Normal cyclic prefix in uplink**	**Extended cyclic prefix in uplink**
Uplink duty factor in one special subframe	**0~3**	7.13%	8.33%
	4~7	14.3%	16.7%

The highest duty factor is resulted from:

i. Uplink-downlink configuration: 0. In a half-frame consisted of 5 subfames, uplink operation is in 3 uplink subframes and 1 special subframe.

ii. special subframe configuration: 5-9 for normal cyclic prefix in downlink, 4-7 for extended cyclic prefix in downlink

iii. for special subframe with extended cyclic prefix in uplink, the total uplink duty factor in one half-frame is: (3+0.167)/5 = 63.3%

iv. for special subframe with normal cyclic prefix in uplink, the total uplink duty factor in one half-frame is: (3+0.143)/5 = 62.9%

v. For TDD LTE SAR measurement, the duty cycle 1:1.59 (62.9 %) was used perform testing and considering the theoretical duty cycle of 63.3% for extended cyclic prefix in the uplink, and the theoretical duty cycle of 62.9% for normal cyclic prefix in uplink, a scaling factor of extended cyclic prefix 63.3%/62.9% = 1.006 is applied to scale-up the measured SAR result. The scaled TDD LTE SAR = measured SAR (W/kg)* Tune-up Scaling Factor* scaling factor for extended cyclic prefix.

<Default Power Mode>

<LTE Band 38>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				37850	38000	38150		
Frequency (MHz)				2580	2595	2610		
20	QPSK	1	0	22.17	22.28	22.32	24	0
20	QPSK	1	49	22.40	22.45	22.53		
20	QPSK	1	99	22.35	22.34	22.50		
20	QPSK	50	0	21.39	21.49	21.43	23	1
20	QPSK	50	24	21.34	21.47	21.48		
20	QPSK	50	50	21.45	21.52	21.55		
20	QPSK	100	0	21.37	21.41	21.86		
20	16QAM	1	0	21.07	21.18	21.20	23	1
20	16QAM	1	49	21.13	21.18	21.38		
20	16QAM	1	99	21.28	21.34	21.37		
20	16QAM	50	0	20.41	20.51	20.32	22	2
20	16QAM	50	24	20.56	20.48	20.55		
20	16QAM	50	50	20.51	20.53	20.51		
20	16QAM	100	0	20.56	20.43	20.48		
Channel				37825	38000	38175	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2577.5	2595	2612.5		
15	QPSK	1	0	22.19	22.20	22.30	24	0
15	QPSK	1	37	22.51	22.54	22.36		
15	QPSK	1	74	22.26	22.34	22.52		
15	QPSK	36	0	21.32	21.49	21.88	23	1
15	QPSK	36	20	21.35	21.41	21.52		
15	QPSK	36	39	21.41	21.49	21.55		
15	QPSK	75	0	21.37	21.48	21.75		
15	16QAM	1	0	21.01	21.42	21.39	23	1
15	16QAM	1	37	21.49	21.64	21.49		
15	16QAM	1	74	21.14	21.03	21.36		
15	16QAM	36	0	20.41	20.49	20.86	22	2
15	16QAM	36	20	20.65	20.52	20.53		
15	16QAM	36	39	20.43	20.57	20.79		
15	16QAM	75	0	20.42	20.45	20.56		
Channel				37800	38000	38200	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2575	2595	2615		
10	QPSK	1	0	22.29	22.43	22.45	24	0
10	QPSK	1	25	22.43	22.50	22.63		
10	QPSK	1	49	22.31	22.50	22.54		
10	QPSK	25	0	21.58	21.52	21.49	23	1
10	QPSK	25	12	21.41	21.51	21.51		
10	QPSK	25	25	21.38	21.47	21.77		
10	QPSK	50	0	21.39	21.48	21.48		
10	16QAM	1	0	21.03	21.24	21.86	23	1
10	16QAM	1	25	21.60	21.70	21.81		
10	16QAM	1	49	21.04	21.08	21.63		
10	16QAM	25	0	20.55	20.76	20.41	22	2
10	16QAM	25	12	20.66	20.76	20.73		
10	16QAM	25	25	20.63	20.71	20.79		
10	16QAM	50	0	20.34	20.35	20.55		

Channel				37775	38000	38225	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2572.5	2595	2617.5		
5	QPSK	1	0	22.08	22.28	22.43	24	0
5	QPSK	1	12	22.54	22.48	22.70		
5	QPSK	1	24	22.19	22.10	22.36		
5	QPSK	12	0	21.50	21.45	21.50	23	1
5	QPSK	12	7	21.30	21.41	21.59		
5	QPSK	12	13	21.38	21.50	21.53		
5	QPSK	25	0	21.30	21.43	21.58		
5	16QAM	1	0	21.02	21.63	21.73	23	1
5	16QAM	1	12	21.44	21.54	21.74		
5	16QAM	1	24	21.01	21.51	21.65		
5	16QAM	12	0	20.21	20.38	20.93	22	2
5	16QAM	12	7	20.32	20.70	20.89		
5	16QAM	12	13	20.48	20.52	20.92		
5	16QAM	25	0	20.55	20.69	21.19		

<LTE Band 41>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Low Middle Ch. / Freq.	Power High Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				40240	40540	40840	41140		
Frequency (MHz)				2555	2585	2615	2645		
20	QPSK	1	0	22.33	22.55	22.41	22.63	24	0
20	QPSK	1	49	22.65	22.74	22.81	22.83		
20	QPSK	1	99	22.64	22.46	22.78	22.82		
20	QPSK	50	0	21.83	22.06	21.92	22.09	23	1
20	QPSK	50	24	21.53	22.01	21.82	21.88		
20	QPSK	50	50	21.81	21.66	21.91	21.88		
20	QPSK	100	0	21.57	21.66	21.63	21.83		
20	16QAM	1	0	21.23	21.07	21.27	21.38	23	1
20	16QAM	1	49	21.82	21.93	21.53	21.76		
20	16QAM	1	99	21.17	21.05	22.03	21.68		
20	16QAM	50	0	20.51	20.92	20.38	21.12	22	2
20	16QAM	50	24	20.70	20.89	20.84	20.85		
20	16QAM	50	50	20.66	20.56	20.69	20.84		
20	16QAM	100	0	20.53	20.57	20.90	20.79		
Channel				40215	40532	40848	41165	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2552.5	2584	2615	2647.5		
15	QPSK	1	0	22.49	22.54	22.53	22.87	24	0
15	QPSK	1	37	22.54	22.44	22.70	23.01		
15	QPSK	1	74	22.54	22.61	22.51	22.84		
15	QPSK	36	0	21.63	21.65	22.07	21.92	23	1
15	QPSK	36	20	21.63	21.65	21.68	22.06		
15	QPSK	36	39	21.63	21.75	21.69	22.07		
15	QPSK	75	0	22.43	22.55	22.45	22.72		
15	16QAM	1	0	21.34	21.03	21.42	21.77	23	1
15	16QAM	1	37	21.25	21.43	21.60	21.70		
15	16QAM	1	74	21.32	21.14	21.03	21.77		
15	16QAM	36	0	20.57	20.55	20.46	20.89	22	2
15	16QAM	36	20	20.54	20.55	20.47	20.94		
15	16QAM	36	39	20.50	20.63	20.58	20.90		
15	16QAM	75	0	21.49	21.70	21.49	21.94		
Channel				40190	40523	40857	41190	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2550	2583.3	2616.7	2650		
10	QPSK	1	0	22.50	22.64	22.47	22.64	24	0
10	QPSK	1	25	22.60	22.51	22.64	22.85		
10	QPSK	1	49	22.58	22.48	22.68	22.66		
10	QPSK	25	0	21.71	21.67	21.78	21.81	23	1
10	QPSK	25	12	21.61	21.68	21.60	21.84		
10	QPSK	25	25	21.59	21.64	21.73	21.89		
10	QPSK	50	0	21.60	21.69	21.66	21.83		
10	16QAM	1	0	20.96	21.14	21.07	21.26	23	1
10	16QAM	1	25	21.24	21.97	21.46	21.66		
10	16QAM	1	49	21.49	21.07	21.54	21.30		
10	16QAM	25	0	20.70	20.90	20.45	21.00	22	2
10	16QAM	25	12	21.11	20.84	20.85	21.09		
10	16QAM	25	25	20.77	20.51	20.88	21.18		
10	16QAM	50	0	20.62	20.66	20.57	20.89		

Channel				40165	40515	40865	41215	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2547.5	2582.5	2617.50	2652.5		
5	QPSK	1	0	22.30	22.42	22.32	22.50	24	0
5	QPSK	1	12	22.62	22.66	22.69	22.74		
5	QPSK	1	24	22.34	22.43	22.45	22.42		
5	QPSK	12	0	21.60	21.58	21.57	21.66	23	1
5	QPSK	12	7	21.42	21.55	22.07	21.59		
5	QPSK	12	13	21.51	21.65	22.09	21.66		
5	QPSK	25	0	21.41	21.63	21.90	21.65		
5	16QAM	1	0	21.24	21.47	21.40	21.08	23	1
5	16QAM	1	12	21.55	21.62	21.66	21.72		
5	16QAM	1	24	21.33	21.49	21.45	21.60		
5	16QAM	12	0	20.40	20.58	20.47	20.46	22	2
5	16QAM	12	7	20.32	20.95	20.60	20.96		
5	16QAM	12	13	20.58	20.60	20.67	20.63		
5	16QAM	25	0	20.63	20.77	20.83	20.87		

<Near-body and Hotspot Mode>

<LTE Band 38>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				37850	38000	38150		
Frequency (MHz)				2580	2595	2610		
20	QPSK	1	0	22.17	22.28	22.32	24	0
20	QPSK	1	49	22.40	22.45	22.53		
20	QPSK	1	99	22.35	22.34	22.50		
20	QPSK	50	0	21.39	21.49	21.43	23	1
20	QPSK	50	24	21.34	21.47	21.48		
20	QPSK	50	50	21.45	21.52	21.55		
20	QPSK	100	0	21.37	21.41	21.86		
20	16QAM	1	0	21.07	21.18	21.20	23	1
20	16QAM	1	49	21.13	21.18	21.38		
20	16QAM	1	99	21.28	21.34	21.37		
20	16QAM	50	0	20.41	20.51	20.32	22	2
20	16QAM	50	24	20.56	20.48	20.55		
20	16QAM	50	50	20.51	20.53	20.51		
20	16QAM	100	0	20.56	20.43	20.48		
Channel				37825	38000	38175	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2577.5	2595	2612.5		
15	QPSK	1	0	22.19	22.20	22.30	24	0
15	QPSK	1	37	22.51	22.54	22.36		
15	QPSK	1	74	22.26	22.34	22.52		
15	QPSK	36	0	21.32	21.49	21.88	23	1
15	QPSK	36	20	21.35	21.41	21.52		
15	QPSK	36	39	21.41	21.49	21.55		
15	QPSK	75	0	21.37	21.48	21.75		
15	16QAM	1	0	21.01	21.42	21.39	23	1
15	16QAM	1	37	21.49	21.64	21.49		
15	16QAM	1	74	21.14	21.03	21.36		
15	16QAM	36	0	20.41	20.49	20.86	22	2
15	16QAM	36	20	20.65	20.52	20.53		
15	16QAM	36	39	20.43	20.57	20.79		
15	16QAM	75	0	20.42	20.45	20.56		
Channel				37800	38000	38200	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2575	2595	2615		
10	QPSK	1	0	22.29	22.43	22.45	24	0
10	QPSK	1	25	22.43	22.50	22.63		
10	QPSK	1	49	22.31	22.50	22.54		
10	QPSK	25	0	21.58	21.52	21.49	23	1
10	QPSK	25	12	21.41	21.51	21.51		
10	QPSK	25	25	21.38	21.47	21.77		
10	QPSK	50	0	21.39	21.48	21.48		
10	16QAM	1	0	21.03	21.24	21.86	23	1
10	16QAM	1	25	21.60	21.70	21.81		
10	16QAM	1	49	21.04	21.08	21.63		
10	16QAM	25	0	20.55	20.76	20.41	22	2
10	16QAM	25	12	20.66	20.76	20.73		
10	16QAM	25	25	20.63	20.71	20.79		
10	16QAM	50	0	20.34	20.35	20.55		

Channel				37775	38000	38225	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2572.5	2595	2617.5		
5	QPSK	1	0	22.08	22.28	22.43	24	0
5	QPSK	1	12	22.54	22.48	22.70		
5	QPSK	1	24	22.19	22.10	22.36		
5	QPSK	12	0	21.50	21.45	21.50	23	1
5	QPSK	12	7	21.30	21.41	21.59		
5	QPSK	12	13	21.38	21.50	21.53		
5	QPSK	25	0	21.30	21.43	21.58		
5	16QAM	1	0	21.02	21.63	21.73	23	1
5	16QAM	1	12	21.44	21.54	21.74		
5	16QAM	1	24	21.01	21.51	21.65		
5	16QAM	12	0	20.21	20.38	20.93	22	2
5	16QAM	12	7	20.32	20.70	20.89		
5	16QAM	12	13	20.48	20.52	20.92		
5	16QAM	25	0	20.55	20.69	21.19		

<LTE Band 41>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Middle Ch. / Freq.	Power Middle Ch. / Freq.	Power High Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				40240	40540	40840	41140		
Frequency (MHz)				2555	2585	2615	2645		
20	QPSK	1	0	22.33	22.55	22.41	22.63	24	0
20	QPSK	1	49	22.65	22.74	22.81	22.83		
20	QPSK	1	99	22.64	22.46	22.78	22.82		
20	QPSK	50	0	21.83	22.06	21.92	22.09	23	1
20	QPSK	50	24	21.53	22.01	21.82	21.88		
20	QPSK	50	50	21.81	21.66	21.91	21.88		
20	QPSK	100	0	21.57	21.66	21.63	21.83		
20	16QAM	1	0	21.23	21.07	21.27	21.38	23	1
20	16QAM	1	49	21.82	21.93	21.53	21.76		
20	16QAM	1	99	21.17	21.05	22.03	21.68		
20	16QAM	50	0	20.51	20.92	20.38	21.12	22	2
20	16QAM	50	24	20.70	20.89	20.84	20.85		
20	16QAM	50	50	20.66	20.56	20.69	20.84		
20	16QAM	100	0	20.53	20.57	20.90	20.79		
Channel				40215	40532	40848	41165	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2552.5	2584	2615	2647.5		
15	QPSK	1	0	22.49	22.54	22.53	22.87	24	0
15	QPSK	1	37	22.54	22.44	22.70	23.01		
15	QPSK	1	74	22.54	22.61	22.51	22.84		
15	QPSK	36	0	21.63	21.65	22.07	21.92	23	1
15	QPSK	36	20	21.63	21.65	21.68	22.06		
15	QPSK	36	39	21.63	21.75	21.69	22.07		
15	QPSK	75	0	22.43	22.55	22.45	22.72		
15	16QAM	1	0	21.34	21.03	21.42	21.77	23	1
15	16QAM	1	37	21.25	21.43	21.60	21.70		
15	16QAM	1	74	21.32	21.14	21.03	21.77		
15	16QAM	36	0	20.57	20.55	20.46	20.89	22	2
15	16QAM	36	20	20.54	20.55	20.47	20.94		
15	16QAM	36	39	20.50	20.63	20.58	20.90		
15	16QAM	75	0	21.49	21.70	21.49	21.94		
Channel				40190	40523	40857	41190	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2550	2583.3	2616.7	2650		
10	QPSK	1	0	22.50	22.64	22.47	22.64	24	0
10	QPSK	1	25	22.60	22.51	22.64	22.85		
10	QPSK	1	49	22.58	22.48	22.68	22.66		
10	QPSK	25	0	21.71	21.67	21.78	21.81	23	1
10	QPSK	25	12	21.61	21.68	21.60	21.84		
10	QPSK	25	25	21.59	21.64	21.73	21.89		
10	QPSK	50	0	21.60	21.69	21.66	21.83		
10	16QAM	1	0	20.96	21.14	21.07	21.26	23	1
10	16QAM	1	25	21.24	21.97	21.46	21.66		
10	16QAM	1	49	21.49	21.07	21.54	21.30		
10	16QAM	25	0	20.70	20.90	20.45	21.00	22	2
10	16QAM	25	12	21.11	20.84	20.85	21.09		
10	16QAM	25	25	20.77	20.51	20.88	21.18		
10	16QAM	50	0	20.62	20.66	20.57	20.89		

Channel				40165	40515	40865	41215	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2547.5	2582.5	2617.50	2652.5		
5	QPSK	1	0	22.30	22.42	22.32	22.50	24	0
5	QPSK	1	12	22.62	22.66	22.69	22.74		
5	QPSK	1	24	22.34	22.43	22.45	22.42		
5	QPSK	12	0	21.60	21.58	21.57	21.66	23	1
5	QPSK	12	7	21.42	21.55	22.07	21.59		
5	QPSK	12	13	21.51	21.65	22.09	21.66		
5	QPSK	25	0	21.41	21.63	21.90	21.65		
5	16QAM	1	0	21.24	21.47	21.40	21.08	23	1
5	16QAM	1	12	21.55	21.62	21.66	21.72		
5	16QAM	1	24	21.33	21.49	21.45	21.60		
5	16QAM	12	0	20.40	20.58	20.47	20.46	22	2
5	16QAM	12	7	20.32	20.95	20.60	20.96		
5	16QAM	12	13	20.58	20.60	20.67	20.63		
5	16QAM	25	0	20.63	20.77	20.83	20.87		

<LTE Rel. 10 Carrier Aggregation>

General Note:

1. This device supports LTE Rel.11 Cat9 and Aggregation on downlink only for inter and intra band, Uplink CA in not supported. For the device supports bands and bandwidths and configurations are provided as follow table was according to 3GPP.
2. All permutations exist. No restrictions on Pcell & Scell combinations.
3. Only supported intra-band non-contiguous CA, intra-band contiguous CA is not supported.

E-UTRA CA Configuration	E-UTRA Bands	Bandwidth [MHz]						Maximum Aggregated bandwidth	Bandwidth combination set
		1.4MHz	3MHz	5MHz	10MHz	15MHz	20MHz		
CA_2A - 4A	2	Yes	Yes	Yes	Yes	Yes	Yes	40	0
	4			Yes	Yes	Yes	Yes		
CA_2A - 4A (1)	2			Yes	Yes			20	1
	4			Yes	Yes				
CA_2A - 4A (2)	2			Yes	Yes	Yes	Yes	40	2
	4			Yes	Yes	Yes	Yes		
CA_4A - 4A	4			Yes	Yes	Yes	Yes	40	0
	4			Yes	Yes	Yes	Yes		
CA_4A - 7A	4			Yes	Yes			30	0
	7			Yes	Yes	Yes	Yes		
CA_7C	7					Yes	Yes	40	0
	7					Yes	Yes		
CA_7A - 7A	7			Yes	Yes	Yes	Yes	40	0
	7			Yes	Yes	Yes	Yes		

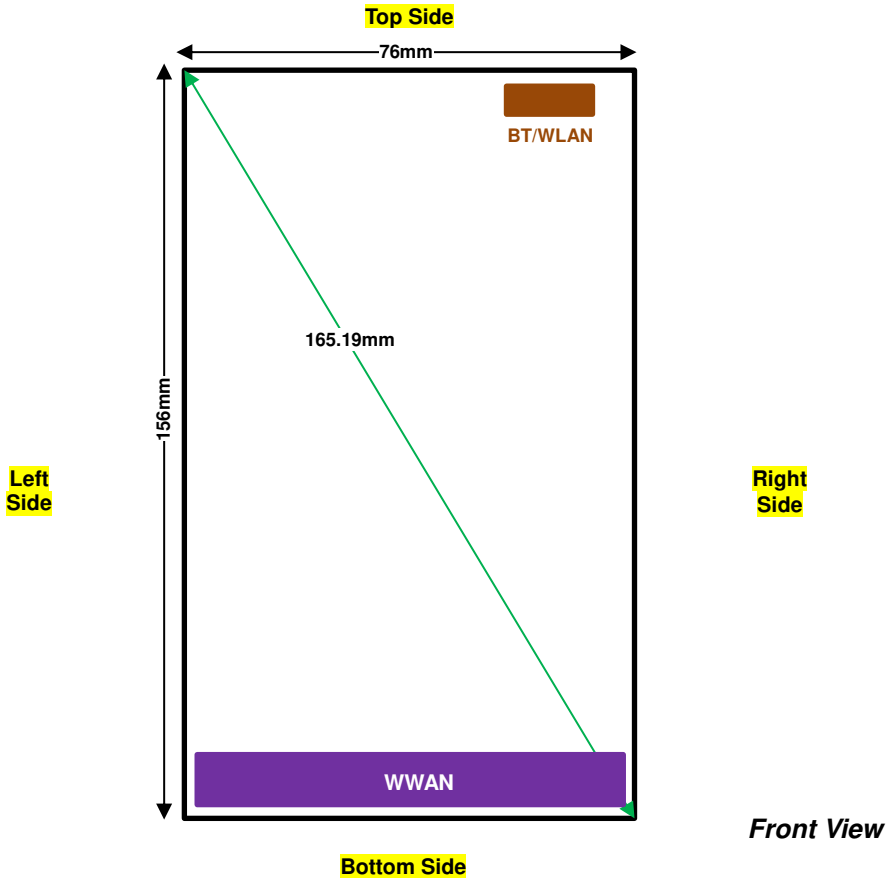
<LTE Carrier Aggregation Conducted Power>

General Note:

1. According to KDB941225 D05A LTE Rel.10 KDB Inquiry Sheet v01r02 LTE CA conducted power requirement will base on below procedure for conducted power verification.
2. Selected highest measured power when downlink carrier aggregation is inactive for conducted power comparison with downlink carrier aggregation is active, to confirm that when downlink carrier aggregation is active uplink maximum output power remains within the specified tune-up tolerance limits and not more than ¼ dB higher than the maximum output power measured when downlink carrier aggregation inactive.
3. For non-contiguous intra-band CA, the SCC selected to provide maximum separation from the PCC and must remain fully within the downlink transmission band.
4. For inter-band CA, the SCC selected highest bandwidth and near the middle of its transmission band.

Configure		PCC							SCC							Power	
		LTE Band	BW (MHz)	UL Freq. (MHz)	UL Channel	Modulation	UL# RB	UL RB Offset	LTE Band	BW (MHz)	DL Freq. (MHz)	DL Channel	Modulation	DL# RB	DL RB Offset	LTE Rel 10 Tx.Power(dBm)	LTE Rel 8 Tx.Power(dBm)
Inter-Band		Band 2	15M	1880	18900	QPSK	1	37	Band 4	20M	2132.5	2175	QPSK	1	49	22.90	22.98
		Band 4	20M	1732.5	20175	QPSK	1	49	Band 2	20M	1960	900	QPSK	1	49	22.95	22.99
		Band 4	20M	1732.5	20175	QPSK	1	49	Band 7	20M	2655	3100	QPSK	1	49	22.94	22.99
		Band 7	20M	2510	20850	QPSK	1	49	Band 4	10M	2132.5	2175	QPSK	1	49	23.80	23.82
Intra-Band	Non-Contiguous	Band 4	20M	1732.5	20175	QPSK	1	49	Band 4	5M	2112.5	1975	QPSK	1	12	22.93	22.99
		Band 7	20M	2510	20850	QPSK	1	49	Band 7	5M	2687.5	3425	QPSK	1	49	23.78	23.82
	Contiguous	Band 7	20M	2525.1	21001	QPSK	1	49	Band 7	20M	2664.9	3199	QPSK	1	49	23.58	23.60

13. Antenna Location



Distance of the Antenna to the EUT surface/edge						
Antennas	Back	Front	Top Side	Bottom Side	Right Side	Left Side
WWAN	≤ 25mm	≤ 25mm	> 25mm	≤ 25mm	≤ 25mm	≤ 25mm
WLAN	≤ 25mm	≤ 25mm	≤ 25mm	> 25mm	≤ 25mm	> 25mm

Positions for SAR tests; Hotspot mode						
Antennas	Back	Front	Top Side	Bottom Side	Right Side	Left Side
WWAN	Yes	Yes	No	Yes	Yes	Yes
WLAN	Yes	Yes	Yes	No	Yes	No

General Note:

1. Referring to KDB 941225 D06 v02r01, when the overall device length and width are > 9cm*5cm, the test distance is 10 mm. SAR must be measured for all sides and surfaces.

14. SAR Test Results

General Note:

1. Per KDB 447498 D01v06, the reported SAR is the measured SAR value adjusted for maximum tune-up tolerance.
   a. Tune-up scaling Factor = tune-up limit power (mW) / EUT RF power (mW), where tune-up limit is the maximum rated power among all production units.
   b. For SAR testing of WLAN signal with non-100% duty cycle, the measured SAR is scaled-up by the duty cycle scaling factor which is equal to "1/(duty cycle)"
   c. For WWAN: Reported SAR(W/kg)= Measured SAR(W/kg)*Tune-up Scaling Factor
2. Per KDB 447498 D01v06, for each exposure position, 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
3. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥0.8W/kg.
4. Per KDB 648474 D04v01r03, when the reported SAR for a body-worn accessory measured without a headset connected to the handset is ≤ 1.2 W/kg, SAR testing with a headset connected to the handset is not required.
5. Per KDB648474 D04v01r03, for smart phones with a display diagonal dimension > 15.0 cm or an overall diagonal dimension > 16.0 cm, when hotspot mode applies, 10-g product specific SAR for WWAN transmitter is required only for the edges according to “operational description” with hotspot mode 1-g reported SAR > 1.2 W/kg, however, when power reduction applies to hotspot mode the measured SAR must be scaled to the maximum output power, including tolerance, allowed for phablet modes to compare with the 1.2W/kg SAR test reduction threshold, for this device all WWAN hotspot mode SAR is less than 1.2W/kg,therefore product specific SAR is not necessary. For 5.3GHz / 5.5GHz WLAN product specific SAR is necessary too, due to an overall diagonal dimension is > 16cm.
6. While operating in “Front” and “Back” configuration by end user, the device will limit different maximum output powers on the GSM850, WCDMA B5 and LTE B5 / B12 / B17 transmitter and detail descriptions of the power reduction mechanism are included in the operational description.
7. While operating in body-adjacent exposure configuration. During a mobile hotspot session, the device will reduced output powers on the GSM850, WCDMA B5 and LTE B5 / B12 / B17 transmitter and detail descriptions of the power reduction mechanism are included in the operational description.
8. This device utilizes dynamic antenna tuning when in the low frequency band transmitter for head and body-worn exposure condition. Please refer to the operational description for functionality description. The test results for this specific condition are labeled as Triggered in the Antenna Tuner column contained in the section14 of the report.
   a. Tigger 1: when the device attached AMP accessory
   b. Tigger 2: when the device charging USB.
   c. Tigger 3: when the device attached AMP accessory and charging USB at the same time.

UMTS Note:

1. Per KDB 941225 D01v03r01, for SAR testing is measured using a 12.2 kbps RMC with TPC bits configured to all “1’s”.
2. Per KDB 941225 D01v03r01, RMC 12.2kbps setting is used to evaluate SAR. If the maximum output power and tune-up tolerance specified for production units in HSDPA / HSUPA / DC-HSDPA is ≤ ¼ dB higher than RMC 12.2Kbps or when the highest reported SAR of the RMC12.2Kbps is scaled by the ratio of specified maximum output power and tune-up tolerance of HSDPA / HSUPA / DC-HSDPA to RMC12.2Kbps and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for HSDPA / HSUPA / DC-HSDPA.

LTE Note:

1. Per KDB 941225 D05v02r05, start with the largest channel bandwidth and measure SAR for QPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power for RB offsets at the upper edge, middle and lower edge of each required test channel.
2. Per KDB 941225 D05v02r05, 50% RB allocation for QPSK SAR testing follows 1RB QPSK allocation procedure.
3. Per KDB 941225 D05v02r05, For QPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations and the highest reported SAR for 1 RB and 50% RB allocation are ≤ 0.8 W/kg. Otherwise, SAR is measured for the highest output power channel; and if the reported SAR is > 1.45 W/kg, the remaining required test channels must also be tested.
4. Per KDB 941225 D05v02r05, 16QAM output power for each RB allocation configuration is > not ½ dB higher than the same configuration in QPSK and the reported SAR for the QPSK configuration is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, 16QAM SAR testing is not required.
5. Per KDB 941225 D05v02r05, Smaller bandwidth output power for each RB allocation configuration is > not ½ dB higher than the same configuration in the largest supported bandwidth, and the reported SAR for the largest supported bandwidth is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, smaller bandwidth SAR testing is not required.
6. For LTE B4 / B12 the maximum bandwidth does not support three non-overlapping channels, per KDB 941225 D05v02r05, 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.
7. LTE Band17/38 SAR test was covered by Band12/41, according to April 2015 TCB workshop, SAR test for overlapping LTE bands can be reduced if
   a. the maximum output power, including tolerance, for the smaller band is ≤ the larger band to qualify for the SAR test exclusion
   b. the channel bandwidth and other operating parameters for the smaller band are fully supported by the larger band

14.1 Head SAR

<WCDMA SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Antenna Tuner	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	WCDMA II	RMC 12.2Kbps	Right Cheek	0mm	NA	9262	1852.4	22.74	24.00	1.337	0.01	0.191	0.255
	WCDMA II	RMC 12.2Kbps	Right Tilted	0mm	NA	9262	1852.4	22.74	24.00	1.337	0.11	0.084	0.112
	WCDMA II	RMC 12.2Kbps	Left Cheek	0mm	NA	9262	1852.4	22.74	24.00	1.337	0.12	0.302	0.404
	WCDMA II	RMC 12.2Kbps	Left Cheek	0mm	NA	9400	1880	22.69	24.00	1.352	0.07	0.281	0.380
01	WCDMA II	RMC 12.2Kbps	Left Cheek	0mm	NA	9538	1907.6	22.73	24.00	1.340	0.07	0.303	0.406
	WCDMA II	RMC 12.2Kbps	Left Tilted	0mm	NA	9262	1852.4	22.74	24.00	1.337	-0.07	0.075	0.100
	WCDMA IV	RMC 12.2Kbps	Right Cheek	0mm	NA	1312	1712.4	23.07	24.00	1.239	0.15	0.261	0.323
	WCDMA IV	RMC 12.2Kbps	Right Cheek	0mm	NA	1413	1732.6	22.98	24.00	1.265	0.19	0.248	0.314
02	WCDMA IV	RMC 12.2Kbps	Right Cheek	0mm	NA	1513	1752.6	22.94	24.00	1.276	0.13	0.264	0.337
	WCDMA IV	RMC 12.2Kbps	Right Tilted	0mm	NA	1312	1712.4	23.07	24.00	1.239	-0.05	0.067	0.083
	WCDMA IV	RMC 12.2Kbps	Left Cheek	0mm	NA	1312	1712.4	23.07	24.00	1.239	0.07	0.230	0.285
	WCDMA IV	RMC 12.2Kbps	Left Tilted	0mm	NA	1312	1712.4	23.07	24.00	1.239	0.01	0.086	0.107

<FDD LTE SAR>

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (mm)	Antenna Tuner	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	LTE Band 2	20M	QPSK	1	49	Right Cheek	0mm	NA	18900	1880	22.74	24.00	1.337	-0.13	0.202	0.270
	LTE Band 2	20M	QPSK	50	0	Right Cheek	0mm	NA	18900	1880	21.79	23.00	1.321	0.07	0.151	0.200
	LTE Band 2	20M	QPSK	1	49	Right Tilted	0mm	NA	18900	1880	22.74	24.00	1.337	0.05	0.102	0.136
	LTE Band 2	20M	QPSK	50	0	Right Tilted	0mm	NA	18900	1880	21.79	23.00	1.321	0.08	0.079	0.104
	LTE Band 2	20M	QPSK	1	49	Left Cheek	0mm	NA	18900	1880	22.74	24.00	1.337	0.1	0.271	0.362
03	LTE Band 2	20M	QPSK	1	49	Left Cheek	0mm	NA	18700	1860	22.60	24.00	1.380	0.01	0.280	0.387
	LTE Band 2	20M	QPSK	1	49	Left Cheek	0mm	NA	19100	1900	22.71	24.00	1.346	0.06	0.286	0.385
	LTE Band 2	20M	QPSK	50	0	Left Cheek	0mm	NA	18900	1880	21.79	23.00	1.321	0.14	0.219	0.289
	LTE Band 2	20M	QPSK	1	49	Left Tilted	0mm	NA	18900	1880	22.74	24.00	1.337	-0.09	0.085	0.114
	LTE Band 2	20M	QPSK	50	0	Left Tilted	0mm	NA	18900	1880	21.79	23.00	1.321	0.08	0.071	0.094
	LTE Band 4	20M	QPSK	1	49	Right Cheek	0mm	NA	20175	1732.5	22.99	24.00	1.262	0	0.224	0.283
	LTE Band 4	20M	QPSK	50	0	Right Cheek	0mm	NA	20175	1732.5	21.69	23.00	1.352	-0.01	0.164	0.222
	LTE Band 4	20M	QPSK	1	49	Right Tilted	0mm	NA	20175	1732.5	22.99	24.00	1.262	0.17	0.056	0.071
	LTE Band 4	20M	QPSK	50	0	Right Tilted	0mm	NA	20175	1732.5	21.69	23.00	1.352	-0.06	0.040	0.054
04	LTE Band 4	20M	QPSK	1	49	Left Cheek	0mm	NA	20175	1732.5	22.99	24.00	1.262	0.07	0.244	0.308
	LTE Band 4	20M	QPSK	50	0	Left Cheek	0mm	NA	20175	1732.5	21.69	23.00	1.352	0.12	0.181	0.245
	LTE Band 4	20M	QPSK	1	49	Left Tilted	0mm	NA	20175	1732.5	22.99	24.00	1.262	0.1	0.089	0.112
	LTE Band 4	20M	QPSK	50	0	Left Tilted	0mm	NA	20175	1732.5	21.69	23.00	1.352	-0.09	0.058	0.078
	LTE Band 12	10M	QPSK	1	25	Right Cheek	0mm	non-Tigger	23095	707.5	22.94	24.00	1.276	-0.09	0.103	0.131
	LTE Band 12	10M	QPSK	25	0	Right Cheek	0mm	non-Tigger	23095	707.5	21.94	23.00	1.276	0.1	0.053	0.068
	LTE Band 12	10M	QPSK	1	25	Right Tilted	0mm	non-Tigger	23095	707.5	22.94	24.00	1.276	0.07	0.042	0.054
	LTE Band 12	10M	QPSK	25	0	Right Tilted	0mm	non-Tigger	23095	707.5	21.94	23.00	1.276	0.11	0.021	0.027
05	LTE Band 12	10M	QPSK	1	25	Left Cheek	0mm	non-Tigger	23095	707.5	22.94	24.00	1.276	-0.02	0.209	0.267
	LTE Band 12	10M	QPSK	1	25	Left Cheek	0mm	Tigger 1	23095	707.5	22.94	24.00	1.276	0.01	0.187	0.239
	LTE Band 12	10M	QPSK	1	25	Left Cheek	0mm	Tigger 2	23095	707.5	22.94	24.00	1.276	-0.18	0.201	0.257
	LTE Band 12	10M	QPSK	1	25	Left Cheek	0mm	Tigger 3	23095	707.5	22.94	24.00	1.276	0.14	0.103	0.131
	LTE Band 12	10M	QPSK	25	0	Left Cheek	0mm	non-Tigger	23095	707.5	21.94	23.00	1.276	0.04	0.109	0.139
	LTE Band 12	10M	QPSK	1	25	Left Tilted	0mm	non-Tigger	23095	707.5	22.94	24.00	1.276	0.05	0.048	0.061
	LTE Band 12	10M	QPSK	25	0	Left Tilted	0mm	non-Tigger	23095	707.5	21.94	23.00	1.276	0.09	0.024	0.031

<TDD LTE SAR>

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Antenna Tuner	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	LTE Band 41	20M	QPSK	1	49	Right Cheek	NA	0mm	41140	2645	22.83	24.00	1.309	62.9	1.006	0.13	0.195	0.257
	LTE Band 41	20M	QPSK	1	49	Right Cheek	NA	0mm	40240	2555	22.65	24.00	1.365	62.9	1.006	0.09	0.120	0.165
06	LTE Band 41	20M	QPSK	1	49	Right Cheek	NA	0mm	40540	2585	22.74	24.00	1.337	62.9	1.006	-0.05	0.198	0.266
	LTE Band 41	20M	QPSK	1	49	Right Cheek	NA	0mm	40840	2615	22.81	24.00	1.315	62.9	1.006	0.07	0.200	0.265
	LTE Band 41	20M	QPSK	50	0	Right Cheek	NA	0mm	41140	2645	22.09	23.00	1.233	62.9	1.006	0.17	0.149	0.185
	LTE Band 41	20M	QPSK	1	49	Right Tilted	NA	0mm	41140	2645	22.83	24.00	1.309	62.9	1.006	0.06	0.064	0.084
	LTE Band 41	20M	QPSK	50	0	Right Tilted	NA	0mm	41140	2645	22.09	23.00	1.233	62.9	1.006	-0.18	0.050	0.062
	LTE Band 41	20M	QPSK	1	49	Left Cheek	NA	0mm	41140	2645	22.83	24.00	1.309	62.9	1.006	0.11	0.161	0.212
	LTE Band 41	20M	QPSK	50	0	Left Cheek	NA	0mm	41140	2645	22.09	23.00	1.233	62.9	1.006	0.11	0.134	0.166
	LTE Band 41	20M	QPSK	1	49	Left Tilted	NA	0mm	41140	2645	22.83	24.00	1.309	62.9	1.006	-0.11	0.095	0.125
	LTE Band 41	20M	QPSK	50	0	Left Tilted	NA	0mm	41140	2645	22.09	23.00	1.233	62.9	1.006	0.05	0.072	0.089

14.2 Hotspot SAR

<WCDMA SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	WCDMA II	RMC 12.2Kbps	Front	10mm	9262	1852.4	22.74	24.00	1.337	0	0.680	0.909
	WCDMA II	RMC 12.2Kbps	Front	10mm	9400	1880	22.69	24.00	1.352	-0.11	0.702	0.949
	WCDMA II	RMC 12.2Kbps	Front	10mm	9538	1907.6	22.73	24.00	1.340	-0.11	0.726	0.973
	WCDMA II	RMC 12.2Kbps	Back	10mm	9262	1852.4	22.74	24.00	1.337	-0.1	0.785	1.049
	WCDMA II	RMC 12.2Kbps	Back	10mm	9400	1880	22.69	24.00	1.352	-0.11	0.835	1.129
	WCDMA II	RMC 12.2Kbps	Back	10mm	9538	1907.6	22.73	24.00	1.340	-0.14	0.856	1.147
	WCDMA II	RMC 12.2Kbps	Left Side	10mm	9262	1852.4	22.74	24.00	1.337	-0.1	0.366	0.489
	WCDMA II	RMC 12.2Kbps	Right Side	10mm	9262	1852.4	22.74	24.00	1.337	0.02	0.199	0.266
	WCDMA II	RMC 12.2Kbps	Bottom Side	10mm	9262	1852.4	22.74	24.00	1.337	-0.07	0.771	1.031
	WCDMA II	RMC 12.2Kbps	Bottom Side	10mm	9400	1880	22.69	24.00	1.352	-0.04	0.788	1.065
07	WCDMA II	RMC 12.2Kbps	Bottom Side	10mm	9538	1907.6	22.73	24.00	1.340	-0.11	0.860	1.152
	WCDMA IV	RMC 12.2Kbps	Front	10mm	1312	1712.4	23.07	24.00	1.239	-0.05	0.687	0.851
	WCDMA IV	RMC 12.2Kbps	Front	10mm	1413	1732.6	22.98	24.00	1.265	0.11	0.712	0.900
	WCDMA IV	RMC 12.2Kbps	Front	10mm	1513	1752.6	22.94	24.00	1.276	-0.03	0.731	0.933
	WCDMA IV	RMC 12.2Kbps	Back	10mm	1312	1712.4	23.07	24.00	1.239	-0.08	0.746	0.924
	WCDMA IV	RMC 12.2Kbps	Back	10mm	1413	1732.6	22.98	24.00	1.265	0	0.760	0.961
	WCDMA IV	RMC 12.2Kbps	Back	10mm	1513	1752.6	22.94	24.00	1.276	-0.07	0.804	1.026
	WCDMA IV	RMC 12.2Kbps	Left Side	10mm	1312	1712.4	23.07	24.00	1.239	-0.11	0.345	0.427
	WCDMA IV	RMC 12.2Kbps	Right Side	10mm	1312	1712.4	23.07	24.00	1.239	0.12	0.157	0.194
	WCDMA IV	RMC 12.2Kbps	Bottom Side	10mm	1312	1712.4	23.07	24.00	1.239	-0.1	0.913	1.131
	WCDMA IV	RMC 12.2Kbps	Bottom Side	10mm	1413	1732.6	22.98	24.00	1.265	-0.01	0.898	1.136
08	WCDMA IV	RMC 12.2Kbps	Bottom Side	10mm	1513	1752.6	22.94	24.00	1.276	-0.12	0.932	1.190

<FDD LTE SAR>

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	LTE Band 2	20M	QPSK	1	49	Front	10mm	18900	1880	22.74	24.00	1.337	-0.07	0.755	1.009
	LTE Band 2	20M	QPSK	1	49	Front	10mm	18700	1860	22.60	24.00	1.380	0.07	0.721	0.995
	LTE Band 2	20M	QPSK	1	49	Front	10mm	19100	1900	22.71	24.00	1.346	0.1	0.771	1.038
	LTE Band 2	20M	QPSK	50	0	Front	10mm	18900	1880	21.79	23.00	1.321	0.01	0.594	0.785
	LTE Band 2	20M	QPSK	100	0	Front	10mm	18900	1880	21.79	23.00	1.321	0.03	0.598	0.790
	LTE Band 2	20M	QPSK	1	49	Back	10mm	18900	1880	22.74	24.00	1.337	-0.12	0.848	1.133
	LTE Band 2	20M	QPSK	1	49	Back	10mm	18700	1860	22.60	24.00	1.380	-0.19	0.785	1.084
	LTE Band 2	20M	QPSK	1	49	Back	10mm	19100	1900	22.71	24.00	1.346	-0.03	0.851	1.145
	LTE Band 2	20M	QPSK	50	0	Back	10mm	18900	1880	21.79	23.00	1.321	-0.14	0.672	0.888
	LTE Band 2	20M	QPSK	50	0	Back	10mm	18700	1860	21.75	23.00	1.334	-0.12	0.632	0.843
	LTE Band 2	20M	QPSK	50	0	Back	10mm	19100	1900	21.56	23.00	1.393	-0.04	0.676	0.942
	LTE Band 2	20M	QPSK	100	0	Back	10mm	18900	1880	21.79	23.00	1.321	0	0.659	0.871
	LTE Band 2	20M	QPSK	1	49	Left Side	10mm	18900	1880	22.74	24.00	1.337	-0.09	0.384	0.513
	LTE Band 2	20M	QPSK	50	0	Left Side	10mm	18900	1880	21.79	23.00	1.321	-0.02	0.296	0.391
	LTE Band 2	20M	QPSK	1	49	Right Side	10mm	18900	1880	22.74	24.00	1.337	0.1	0.222	0.297
	LTE Band 2	20M	QPSK	50	0	Right Side	10mm	18900	1880	21.79	23.00	1.321	0.09	0.175	0.231
	LTE Band 2	20M	QPSK	1	49	Bottom Side	10mm	18900	1880	22.74	24.00	1.337	-0.06	0.837	1.119
	LTE Band 2	20M	QPSK	1	49	Bottom Side	10mm	18700	1860	22.60	24.00	1.380	0.04	0.794	1.096
09	LTE Band 2	20M	QPSK	1	49	Bottom Side	10mm	19100	1900	22.71	24.00	1.346	-0.13	0.875	1.178
	LTE Band 2	20M	QPSK	50	0	Bottom Side	10mm	18900	1880	21.79	23.00	1.321	-0.12	0.680	0.898
	LTE Band 2	20M	QPSK	50	0	Bottom Side	10mm	18700	1860	21.75	23.00	1.334	-0.12	0.680	0.907
	LTE Band 2	20M	QPSK	50	0	Bottom Side	10mm	19100	1900	21.56	23.00	1.393	-0.07	0.726	1.011
	LTE Band 2	20M	QPSK	100	0	Bottom Side	10mm	18900	1880	21.79	23.00	1.321	-0.02	0.689	0.910
	LTE Band 4	20M	QPSK	1	49	Front	10mm	20175	1732.5	22.99	24.00	1.262	-0.05	0.738	0.931
	LTE Band 4	20M	QPSK	50	0	Front	10mm	20175	1732.5	21.69	23.00	1.352	-0.11	0.592	0.800
	LTE Band 4	20M	QPSK	100	0	Front	10mm	20175	1732.5	21.57	23.00	1.390	0.02	0.548	0.762
	LTE Band 4	20M	QPSK	1	49	Back	10mm	20175	1732.5	22.99	24.00	1.262	-0.07	0.780	0.984
	LTE Band 4	20M	QPSK	50	0	Back	10mm	20175	1732.5	21.69	23.00	1.352	-0.11	0.626	0.846
	LTE Band 4	20M	QPSK	100	0	Back	10mm	20175	1732.5	21.57	23.00	1.390	-0.08	0.592	0.823
	LTE Band 4	20M	QPSK	1	49	Left Side	10mm	20175	1732.5	22.99	24.00	1.262	-0.01	0.340	0.429
	LTE Band 4	20M	QPSK	50	0	Left Side	10mm	20175	1732.5	21.69	23.00	1.352	0.09	0.274	0.370
	LTE Band 4	20M	QPSK	1	49	Right Side	10mm	20175	1732.5	22.99	24.00	1.262	-0.03	0.191	0.241
	LTE Band 4	20M	QPSK	50	0	Right Side	10mm	20175	1732.5	21.69	23.00	1.352	-0.01	0.144	0.195
10	LTE Band 4	20M	QPSK	1	49	Bottom Side	10mm	20175	1732.5	22.99	24.00	1.262	-0.08	0.862	1.088
	LTE Band 4	20M	QPSK	50	0	Bottom Side	10mm	20175	1732.5	21.69	23.00	1.352	-0.02	0.704	0.952
	LTE Band 4	20M	QPSK	100	0	Bottom Side	10mm	20175	1732.5	21.57	23.00	1.390	-0.06	0.689	0.958
	LTE Band 12	10M	QPSK	1	0	Front	10mm	23095	707.5	21.60	23.00	1.380	-0.1	0.645	0.890
	LTE Band 12	10M	QPSK	25	0	Front	10mm	23095	707.5	21.88	22.00	1.028	-0.16	0.485	0.499
	LTE Band 12	10M	QPSK	50	0	Front	10mm	23095	707.5	21.87	22.00	1.030	-0.14	0.576	0.594
11	LTE Band 12	10M	QPSK	1	0	Back	10mm	23095	707.5	21.60	23.00	1.380	0.17	0.783	1.081
	LTE Band 12	10M	QPSK	25	0	Back	10mm	23095	707.5	21.88	22.00	1.028	-0.08	0.594	0.611
	LTE Band 12	10M	QPSK	50	0	Back	10mm	23095	707.5	21.87	22.00	1.030	-0.07	0.659	0.679
	LTE Band 12	10M	QPSK	1	0	Left Side	10mm	23095	707.5	21.60	23.00	1.380	-0.1	0.190	0.262
	LTE Band 12	10M	QPSK	25	0	Left Side	10mm	23095	707.5	21.88	22.00	1.028	-0.16	0.145	0.149
	LTE Band 12	10M	QPSK	1	0	Right Side	10mm	23095	707.5	21.60	23.00	1.380	-0.15	0.031	0.043
	LTE Band 12	10M	QPSK	25	0	Right Side	10mm	23095	707.5	21.88	22.00	1.028	-0.13	0.023	0.024
	LTE Band 12	10M	QPSK	1	0	Bottom Side	10mm	23095	707.5	21.60	23.00	1.380	-0.1	0.399	0.551
	LTE Band 12	10M	QPSK	25	0	Bottom Side	10mm	23095	707.5	21.88	22.00	1.028	-0.09	0.290	0.298

<TDD LTE SAR>

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
12	LTE Band 41	20M	QPSK	1	49	Front	10mm	41140	2645	22.83	24.00	1.309	62.9	1.006	-0.11	0.605	0.797
	LTE Band 41	20M	QPSK	1	49	Front	10mm	40240	2555	22.65	24.00	1.365	62.9	1.006	0.09	0.356	0.489
	LTE Band 41	20M	QPSK	1	49	Front	10mm	40540	2585	22.74	24.00	1.337	62.9	1.006	0.1	0.484	0.651
	LTE Band 41	20M	QPSK	1	49	Front	10mm	40840	2615	22.81	24.00	1.315	62.9	1.006	-0.08	0.557	0.737
	LTE Band 41	20M	QPSK	50	0	Front	10mm	41140	2645	22.09	23.00	1.233	62.9	1.006	-0.16	0.483	0.599
	LTE Band 41	20M	QPSK	100	0	Front	10mm	41140	2645	21.83	23.00	1.309	62.9	1.006	-0.06	0.317	0.418
	LTE Band 41	20M	QPSK	1	49	Back	10mm	41140	2645	22.83	24.00	1.309	62.9	1.006	0.07	0.591	0.778
	LTE Band 41	20M	QPSK	1	49	Back	10mm	40240	2555	22.65	24.00	1.365	62.9	1.006	0.01	0.290	0.398
	LTE Band 41	20M	QPSK	1	49	Back	10mm	40540	2585	22.74	24.00	1.337	62.9	1.006	-0.11	0.418	0.562
	LTE Band 41	20M	QPSK	1	49	Back	10mm	40840	2615	22.81	24.00	1.315	62.9	1.006	0.08	0.491	0.650
	LTE Band 41	20M	QPSK	50	0	Back	10mm	41140	2645	22.09	23.00	1.233	62.9	1.006	0.09	0.468	0.581
	LTE Band 41	20M	QPSK	100	0	Back	10mm	41140	2645	21.83	23.00	1.309	62.9	1.006	-0.03	0.251	0.331
	LTE Band 41	20M	QPSK	1	49	Left Side	10mm	41140	2645	22.83	24.00	1.309	62.9	1.006	0.07	0.059	0.078
	LTE Band 41	20M	QPSK	50	0	Left Side	10mm	41140	2645	22.09	23.00	1.233	62.9	1.006	-0.04	0.046	0.057
	LTE Band 41	20M	QPSK	1	49	Right Side	10mm	41140	2645	22.83	24.00	1.309	62.9	1.006	-0.08	0.131	0.173
	LTE Band 41	20M	QPSK	50	0	Right Side	10mm	41140	2645	22.09	23.00	1.233	62.9	1.006	-0.12	0.103	0.128
	LTE Band 41	20M	QPSK	1	49	Bottom Side	10mm	41140	2645	22.83	24.00	1.309	62.9	1.006	-0.06	0.602	0.793
	LTE Band 41	20M	QPSK	1	49	Bottom Side	10mm	40240	2555	22.65	24.00	1.365	62.9	1.006	0.12	0.527	0.723
	LTE Band 41	20M	QPSK	1	49	Bottom Side	10mm	40540	2585	22.74	24.00	1.337	62.9	1.006	0.13	0.550	0.740
	LTE Band 41	20M	QPSK	1	49	Bottom Side	10mm	40840	2615	22.81	24.00	1.315	62.9	1.006	-0.09	0.568	0.752
	LTE Band 41	20M	QPSK	50	0	Bottom Side	10mm	41140	2645	22.09	23.00	1.233	62.9	1.006	-0.09	0.434	0.538
	LTE Band 41	20M	QPSK	100	0	Bottom Side	10mm	41140	2645	21.83	23.00	1.309	62.9	1.006	-0.02	0.445	0.586

14.3 Body Worn Accessory SAR

<WCDMA SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Antenna Tuner	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	WCDMA II	RMC 12.2Kbps	Front	10mm	NA	9262	1852.4	22.74	24.00	1.337	0	0.680	0.909
	WCDMA II	RMC 12.2Kbps	Front	10mm	NA	9400	1880	22.69	24.00	1.352	-0.11	0.702	0.949
	WCDMA II	RMC 12.2Kbps	Front	10mm	NA	9538	1907.6	22.73	24.00	1.340	-0.11	0.726	0.973
	WCDMA II	RMC 12.2Kbps	Back	10mm	NA	9262	1852.4	22.74	24.00	1.337	-0.1	0.785	1.049
	WCDMA II	RMC 12.2Kbps	Back	10mm	NA	9400	1880	22.69	24.00	1.352	-0.11	0.835	1.129
13	WCDMA II	RMC 12.2Kbps	Back	10mm	NA	9538	1907.6	22.73	24.00	1.340	-0.14	0.856	1.147
	WCDMA IV	RMC 12.2Kbps	Front	10mm	NA	1312	1712.4	23.07	24.00	1.239	-0.05	0.687	0.851
	WCDMA IV	RMC 12.2Kbps	Front	10mm	NA	1413	1732.6	22.98	24.00	1.265	0.11	0.712	0.900
	WCDMA IV	RMC 12.2Kbps	Front	10mm	NA	1513	1752.6	22.94	24.00	1.276	-0.03	0.731	0.933
	WCDMA IV	RMC 12.2Kbps	Back	10mm	NA	1312	1712.4	23.07	24.00	1.239	-0.08	0.746	0.924
	WCDMA IV	RMC 12.2Kbps	Back	10mm	NA	1413	1732.6	22.98	24.00	1.265	0	0.760	0.961
14	WCDMA IV	RMC 12.2Kbps	Back	10mm	NA	1513	1752.6	22.94	24.00	1.276	-0.07	0.804	1.026

<FDD LTE SAR>

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (mm)	Antenna Tuner	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	LTE Band 2	20M	QPSK	1	49	Front	10mm	NA	18900	1880	22.74	24.00	1.337	-0.07	0.755	1.009
	LTE Band 2	20M	QPSK	1	49	Front	10mm	NA	18700	1860	22.60	24.00	1.380	0.07	0.721	0.995
	LTE Band 2	20M	QPSK	1	49	Front	10mm	NA	19100	1900	22.71	24.00	1.346	0.1	0.771	1.038
	LTE Band 2	20M	QPSK	50	0	Front	10mm	NA	18900	1880	21.79	23.00	1.321	0.01	0.594	0.785
	LTE Band 2	20M	QPSK	100	0	Front	10mm	NA	18900	1880	21.79	23.00	1.321	0.03	0.598	0.790
	LTE Band 2	20M	QPSK	1	49	Back	10mm	NA	18900	1880	22.74	24.00	1.337	-0.12	0.848	1.133
	LTE Band 2	20M	QPSK	1	49	Back	10mm	NA	18700	1860	22.60	24.00	1.380	-0.19	0.785	1.084
15	LTE Band 2	20M	QPSK	1	49	Back	10mm	NA	19100	1900	22.71	24.00	1.346	-0.03	0.851	1.145
	LTE Band 2	20M	QPSK	50	0	Back	10mm	NA	18900	1880	21.79	23.00	1.321	-0.14	0.672	0.888
	LTE Band 2	20M	QPSK	50	0	Back	10mm	NA	18700	1860	21.75	23.00	1.334	-0.12	0.632	0.843
	LTE Band 2	20M	QPSK	50	0	Back	10mm	NA	19100	1900	21.56	23.00	1.393	-0.04	0.676	0.942
	LTE Band 2	20M	QPSK	100	0	Back	10mm	NA	18900	1880	21.79	23.00	1.321	0	0.659	0.871
	LTE Band 4	20M	QPSK	1	49	Front	10mm	NA	20175	1732.5	22.99	24.00	1.262	-0.05	0.738	0.931
	LTE Band 4	20M	QPSK	50	0	Front	10mm	NA	20175	1732.5	21.69	23.00	1.352	-0.11	0.592	0.800
	LTE Band 4	20M	QPSK	100	0	Front	10mm	NA	20175	1732.5	21.57	23.00	1.390	0.02	0.548	0.762
16	LTE Band 4	20M	QPSK	1	49	Back	10mm	NA	20175	1732.5	22.99	24.00	1.262	-0.07	0.780	0.984
	LTE Band 4	20M	QPSK	50	0	Back	10mm	NA	20175	1732.5	21.69	23.00	1.352	-0.11	0.626	0.846
	LTE Band 4	20M	QPSK	100	0	Back	10mm	NA	20175	1732.5	21.57	23.00	1.390	-0.08	0.592	0.823
	LTE Band 12	10M	QPSK	1	0	Front	10mm	non-Tigger	23095	707.5	21.60	23.00	1.380	-0.1	0.645	0.890
	LTE Band 12	10M	QPSK	1	0	Front	10mm	Tigger 1	23095	707.5	21.60	23.00	1.380	0.03	0.675	0.932
	LTE Band 12	10M	QPSK	1	0	Front	10mm	Tigger 2	23095	707.5	21.60	23.00	1.380	-0.12	0.651	0.899
	LTE Band 12	10M	QPSK	1	0	Front	10mm	Tigger 3	23095	707.5	21.60	23.00	1.380	0.04	0.679	0.937
	LTE Band 12	10M	QPSK	25	0	Front	10mm	non-Tigger	23095	707.5	21.88	22.00	1.028	-0.16	0.485	0.499
	LTE Band 12	10M	QPSK	50	0	Front	10mm	non-Tigger	23095	707.5	21.87	22.00	1.030	-0.14	0.576	0.594
17	LTE Band 12	10M	QPSK	1	0	Back	10mm	non-Tigger	23095	707.5	21.60	23.00	1.380	0.17	0.783	1.081
	LTE Band 12	10M	QPSK	25	0	Back	10mm	non-Tigger	23095	707.5	21.88	22.00	1.028	-0.08	0.594	0.611
	LTE Band 12	10M	QPSK	50	0	Back	10mm	non-Tigger	23095	707.5	21.87	22.00	1.030	-0.07	0.659	0.679

<TDD LTE SAR>

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (mm)	Antenna Tuner	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
18	LTE Band 41	20M	QPSK	1	49	Front	10mm	NA	41140	2645	22.83	24.00	1.309	62.9	1.006	-0.11	0.605	0.797
	LTE Band 41	20M	QPSK	1	49	Front	10mm	NA	40240	2555	22.65	24.00	1.365	62.9	1.006	0.09	0.356	0.489
	LTE Band 41	20M	QPSK	1	49	Front	10mm	NA	40540	2585	22.74	24.00	1.337	62.9	1.006	0.1	0.484	0.651
	LTE Band 41	20M	QPSK	1	49	Front	10mm	NA	40840	2615	22.81	24.00	1.315	62.9	1.006	-0.08	0.557	0.737
	LTE Band 41	20M	QPSK	50	0	Front	10mm	NA	41140	2645	22.09	23.00	1.233	62.9	1.006	-0.16	0.483	0.599
	LTE Band 41	20M	QPSK	100	0	Front	10mm	NA	41140	2645	21.83	23.00	1.309	62.9	1.006	-0.06	0.317	0.418
	LTE Band 41	20M	QPSK	1	49	Back	10mm	NA	41140	2645	22.83	24.00	1.309	62.9	1.006	0.07	0.591	0.778
	LTE Band 41	20M	QPSK	1	49	Back	10mm	NA	40240	2555	22.65	24.00	1.365	62.9	1.006	0.01	0.290	0.398
	LTE Band 41	20M	QPSK	1	49	Back	10mm	NA	40540	2585	22.74	24.00	1.337	62.9	1.006	-0.11	0.418	0.562
	LTE Band 41	20M	QPSK	1	49	Back	10mm	NA	40840	2615	22.81	24.00	1.315	62.9	1.006	0.08	0.491	0.650
	LTE Band 41	20M	QPSK	50	0	Back	10mm	NA	41140	2645	22.09	23.00	1.233	62.9	1.006	0.09	0.468	0.581
	LTE Band 41	20M	QPSK	100	0	Back	10mm	NA	41140	2645	21.83	23.00	1.309	62.9	1.006	-0.03	0.251	0.331

14.4 Repeated SAR Measurement

No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Mode	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Ratio	Reported 1g SAR (W/kg)
1st	WCDMA IV					RMC 12.2Kbps	Bottom Side	10mm	1513	1752.6	22.94	24.00	1.276	-0.12	0.932		1.190
2nd	WCDMA IV					RMC 12.2Kbps	Bottom Side	10mm	1513	1752.6	22.94	24.00	1.276	-0.05	0.907	1.03	1.158
1st	LTE Band 2	20M	QPSK	1	49		Bottom Side	10mm	19100	1900	22.71	24.00	1.346	-0.13	0.875		1.178
2nd	LTE Band 2	20M	QPSK	1	49		Bottom Side	10mm	19100	1900	22.71	24.00	1.346	-0.12	0.874	1.00	1.176

General Note:

1. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥0.8W/kg.
2. Per KDB 865664 D01v01r04, if the ratio among the repeated measurement is ≤ 1.2 and the measured SAR <1.45W/kg, only one repeated measurement is required.
3. The ratio is the difference in percentage between original and repeated *measured SAR*.
4. All measurement SAR result is scaled-up to account for tune-up tolerance and is compliant.

15. Simultaneous Transmission Analysis

NO.	Simultaneous Transmission Configurations	Portable Handset			
		Head	Body-worn	Hotspot	Product Specific
1.	GSM Voice + WLAN2.4GHz	Yes	Yes		Yes
2.	GPRS/EDGE + WLAN2.4GHz	Yes	Yes	Yes	Yes
3.	WCDMA + WLAN2.4GHz	Yes	Yes	Yes	Yes
4.	LTE + WLAN2.4GHz	Yes	Yes	Yes	Yes
5.	GSM Voice + Bluetooth		Yes		Yes
6.	GPRS/EDGE + Bluetooth		Yes		Yes
7.	WCDMA+ Bluetooth		Yes		Yes
8.	LTE + Bluetooth		Yes		Yes
9.	GSM Voice + WLAN5GHz	Yes	Yes		Yes
10.	GPRS/EDGE + WLAN5GHz	Yes	Yes	Yes	Yes
11.	WCDMA + WLAN5GHz	Yes	Yes	Yes	Yes
12.	LTE + WLAN5GHz	Yes	Yes	Yes	Yes

General Note:

1. This device 2.4GHz / 5.2GHz / 5.8GHz WLAN supports Hotspot operation and WiFi Direct (Group Client / Group Owner), and 5.3GHz / 5.5GHz WLAN supports WiFi Direct (Group Client).
2. The worst case WLAN reported SAR for each configuration was used for SAR summation. Therefore, the following summations represent the absolute worst cases for simultaneous transmission with WLAN.
3. 2.4GHz WLAN and Bluetooth cannot transmit simultaneously.
4. EUT will choose either WLAN 2.4GHz or WLAN 5GHz according to the network signal condition; therefore, 2.4GHz WLAN and 5GHz WLAN will not operate simultaneously at any moment.
5. The Scaled SAR summation is calculated based on the same configuration and test position.
6. Per KDB 447498 D01v06, simultaneous transmission SAR is compliant if,
   i) Scalar SAR summation < 1.6W/kg.
   ii) SPLSR = (SAR1 + SAR2)^1.5 / (min. separation distance, mm), and the peak separation distance is determined from the square root of [(x1-x2)2 + (y1-y2)2 + (z1-z2)2], where (x1, y1, z1) and (x2, y2, z2) are the coordinates of the extrapolated peak SAR locations in the zoom scan.
   iii) If SPLSR ≤ 0.04, simultaneously transmission SAR measurement is not necessary.
   iv) Simultaneously transmission SAR measurement, and the reported multi-band SAR < 1.6W/kg.
   v) The SPLSR calculated results please refer to section 15.5.

15.1 Head Exposure Conditions

WWAN Band		Exposure Position	1 WWAN 1g SAR (W/kg)	2 2.4GHz WLAN 1g SAR (W/kg)	1+2 Summed 1g SAR (W/kg)	SPLSR	Case No
GSM	GSM850	Right Cheek	0.366	0.701	**1.067**		
		Right Tilted	0.166	0.698	**0.864**		
		Left Cheek	0.299	1.394	**1.693**	0.03	Case 1
		Left Tilted	0.144	1.040	**1.184**		
	GSM1900	Right Cheek	0.234	0.701	**0.935**		
		Right Tilted	0.073	0.698	**0.771**		
		Left Cheek	0.186	1.394	**1.580**		
		Left Tilted	0.064	1.040	**1.104**		
WCDMA	WCDMA II	Right Cheek	0.255	0.701	**0.956**		
		Right Tilted	0.112	0.698	**0.810**		
		Left Cheek	0.406	1.394	**1.800**	0.03	Case 2
		Left Tilted	0.100	1.040	**1.140**		
	WCDMA IV	Right Cheek	0.337	0.701	**1.038**		
		Right Tilted	0.083	0.698	**0.781**		
		Left Cheek	0.285	1.394	**1.679**	0.02	Case 3
		Left Tilted	0.107	1.040	**1.147**		
	WCDMA V	Right Cheek	0.481	0.701	**1.182**		
		Right Tilted	0.239	0.698	**0.937**		
		Left Cheek	0.398	1.394	**1.792**	0.03	Case 4
		Left Tilted	0.194	1.040	**1.234**		
LTE	LTE Band 2	Right Cheek	0.270	0.701	**0.971**		
		Right Tilted	0.136	0.698	**0.834**		
		Left Cheek	0.387	1.394	**1.781**	0.03	Case 5
		Left Tilted	0.114	1.040	**1.154**		
	LTE Band 4	Right Cheek	0.283	0.701	**0.984**		
		Right Tilted	0.071	0.698	**0.769**		
		Left Cheek	0.308	1.394	**1.702**	0.02	Case 6
		Left Tilted	0.112	1.040	**1.152**		
	LTE Band 5	Right Cheek	0.341	0.701	**1.042**		
		Right Tilted	0.197	0.698	**0.895**		
		Left Cheek	0.339	1.394	**1.733**	0.03	Case 7
		Left Tilted	0.182	1.040	**1.222**		
	LTE Band 7	Right Cheek	0.394	0.701	**1.095**		
		Right Tilted	0.121	0.698	**0.819**		
		Left Cheek	0.281	1.394	**1.675**	0.02	Case 8
		Left Tilted	0.115	1.040	**1.155**		
	LTE Band 12	Right Cheek	0.131	0.701	**0.832**		
		Right Tilted	0.054	0.698	**0.752**		
		Left Cheek	0.267	1.394	**1.661**	0.02	Case 9
		Left Tilted	0.061	1.040	**1.101**		
	LTE Band 41	Right Cheek	0.266	0.701	**0.967**		
		Right Tilted	0.084	0.698	**0.782**		
		Left Cheek	0.212	1.394	**1.606**	0.02	Case 10
		Left Tilted	0.125	1.040	**1.165**		

WWAN Band		Exposure Position	1 WWAN 1g SAR (W/kg)	3 5GHz WLAN 1g SAR (W/kg)	1+3 Summed 1g SAR (W/kg)	SPLSR	Case No
GSM	GSM850	Right Cheek	0.366	0.657	**1.023**		
		Right Tilted	0.166	0.478	**0.644**		
		Left Cheek	0.299	1.452	**1.751**	0.03	Case 11
		Left Tilted	0.144	0.794	**0.938**		
	GSM1900	Right Cheek	0.234	0.657	**0.891**		
		Right Tilted	0.073	0.478	**0.551**		
		Left Cheek	0.186	1.452	**1.638**	0.02	Case 12
		Left Tilted	0.064	0.794	**0.858**		
WCDMA	WCDMA II	Right Cheek	0.255	0.657	**0.912**		
		Right Tilted	0.112	0.478	**0.590**		
		Left Cheek	0.406	1.452	**1.858**	0.03	Case 13
		Left Tilted	0.100	0.794	**0.894**		
	WCDMA IV	Right Cheek	0.337	0.657	**0.994**		
		Right Tilted	0.083	0.478	**0.561**		
		Left Cheek	0.285	1.452	**1.737**	0.02	Case 14
		Left Tilted	0.107	0.794	**0.901**		
	WCDMA V	Right Cheek	0.481	0.657	**1.138**		
		Right Tilted	0.239	0.478	**0.717**		
		Left Cheek	0.398	1.452	**1.850**	0.03	Case 15
		Left Tilted	0.194	0.794	**0.988**		
LTE	LTE Band 2	Right Cheek	0.270	0.657	**0.927**		
		Right Tilted	0.136	0.478	**0.614**		
		Left Cheek	0.387	1.452	**1.839**	0.03	Case 16
		Left Tilted	0.114	0.794	**0.908**		
	LTE Band 4	Right Cheek	0.283	0.657	**0.940**		
		Right Tilted	0.071	0.478	**0.549**		
		Left Cheek	0.308	1.452	**1.760**	0.02	Case 17
		Left Tilted	0.112	0.794	**0.906**		
	LTE Band 5	Right Cheek	0.341	0.657	**0.998**		
		Right Tilted	0.197	0.478	**0.675**		
		Left Cheek	0.339	1.452	**1.791**	0.03	Case 18
		Left Tilted	0.182	0.794	**0.976**		
	LTE Band 7	Right Cheek	0.394	0.657	**1.051**		
		Right Tilted	0.121	0.478	**0.599**		
		Left Cheek	0.281	1.452	**1.733**	0.02	Case 19
		Left Tilted	0.115	0.794	**0.909**		
	LTE Band 12	Right Cheek	0.131	0.657	**0.788**		
		Right Tilted	0.054	0.478	**0.532**		
		Left Cheek	0.267	1.452	**1.719**	0.02	Case 20
		Left Tilted	0.061	0.794	**0.855**		
	LTE Band 41	Right Cheek	0.266	0.657	**0.923**		
		Right Tilted	0.084	0.478	**0.562**		
		Left Cheek	0.212	1.452	**1.664**	0.02	Case 21
		Left Tilted	0.125	0.794	**0.919**		

15.2 Hotspot Exposure Conditions

WWAN Band		Exposure Position	1 WWAN 1g SAR (W/kg)	2 2.4GHz WLAN 1g SAR (W/kg)	3 5GHz WLAN 1g SAR (W/kg)	1+2 Summed 1g SAR (W/kg)	1+3 Summed 1g SAR (W/kg)
GSM	GSM850	Front	0.942	0.311	0.255	**1.253**	**1.197**
		Back	1.054	0.129	0.062	**1.183**	**1.116**
		Left side	0.174			**0.174**	**0.174**
		Right side	0.315	0.026	0.045	**0.341**	**0.360**
		Top side		0.049	0.062	**0.049**	**0.062**
		Bottom side	0.298			**0.298**	**0.298**
	GSM1900	Front	0.551	0.311	0.255	**0.862**	**0.806**
		Back	0.604	0.129	0.062	**0.733**	**0.666**
		Left side	0.295			**0.295**	**0.295**
		Right side	0.204	0.026	0.045	**0.230**	**0.249**
		Top side		0.049	0.062	**0.049**	**0.062**
		Bottom side	0.683			**0.683**	**0.683**
WCDMA	WCDMA II	Front	0.973	0.311	0.255	**1.284**	**1.228**
		Back	1.147	0.129	0.062	**1.276**	**1.209**
		Left side	0.489			**0.489**	**0.489**
		Right side	0.266	0.026	0.045	**0.292**	**0.311**
		Top side		0.049	0.062	**0.049**	**0.062**
		Bottom side	1.152			**1.152**	**1.152**
	WCDMA IV	Front	0.933	0.311	0.255	**1.244**	**1.188**
		Back	1.026	0.129	0.062	**1.155**	**1.088**
		Left side	0.427			**0.427**	**0.427**
		Right side	0.194	0.026	0.045	**0.220**	**0.239**
		Top side		0.049	0.062	**0.049**	**0.062**
		Bottom side	1.190			**1.190**	**1.190**
	WCDMA V	Front	0.916	0.311	0.255	**1.227**	**1.171**
		Back	1.005	0.129	0.062	**1.134**	**1.067**
		Left side	0.159			**0.159**	**0.159**
		Right side	0.313	0.026	0.045	**0.339**	**0.358**
		Top side		0.049	0.062	**0.049**	**0.062**
		Bottom side	0.318			**0.318**	**0.318**

WWAN Band		Exposure Position	1 WWAN 1g SAR (W/kg)	2 2.4GHz WLAN 1g SAR (W/kg)	3 5GHz WLAN 1g SAR (W/kg)	1+2 Summed 1g SAR (W/kg)	1+3 Summed 1g SAR (W/kg)
LTE	LTE Band 2	Front	1.038	0.311	0.255	**1.349**	**1.293**
		Back	1.145	0.129	0.062	**1.274**	**1.207**
		Left side	0.513			**0.513**	**0.513**
		Right side	0.297	0.026	0.045	**0.323**	**0.342**
		Top side		0.049	0.062	**0.049**	**0.062**
		Bottom side	1.178			**1.178**	**1.178**
	LTE Band 4	Front	0.931	0.311	0.255	**1.242**	**1.186**
		Back	0.984	0.129	0.062	**1.113**	**1.046**
		Left side	0.429			**0.429**	**0.429**
		Right side	0.241	0.026	0.045	**0.267**	**0.286**
		Top side		0.049	0.062	**0.049**	**0.062**
		Bottom side	1.088			**1.088**	**1.088**
	LTE Band 5	Front	0.874	0.311	0.255	**1.185**	**1.129**
		Back	0.926	0.129	0.062	**1.055**	**0.988**
		Left side	0.164			**0.164**	**0.164**
		Right side	0.344	0.026	0.045	**0.370**	**0.389**
		Top side		0.049	0.062	**0.049**	**0.062**
		Bottom side	0.394			**0.394**	**0.394**
	LTE Band 7	Front	0.959	0.311	0.255	**1.270**	**1.214**
		Back	0.918	0.129	0.062	**1.047**	**0.980**
		Left side	0.165			**0.165**	**0.165**
		Right side	0.315	0.026	0.045	**0.341**	**0.360**
		Top side		0.049	0.062	**0.049**	**0.062**
		Bottom side	1.081			**1.081**	**1.081**
	LTE Band 12	Front	0.890	0.311	0.255	**1.201**	**1.145**
		Back	1.081	0.129	0.062	**1.210**	**1.143**
		Left side	0.262			**0.262**	**0.262**
		Right side	0.043	0.026	0.045	**0.069**	**0.088**
		Top side		0.049	0.062	**0.049**	**0.062**
		Bottom side	0.551			**0.551**	**0.551**
	LTE Band 41	Front	0.797	0.311	0.255	**1.108**	**1.052**
		Back	0.778	0.129	0.062	**0.907**	**0.840**
		Left side	0.078			**0.078**	**0.078**
		Right side	0.173	0.026	0.045	**0.199**	**0.218**
		Top side		0.049	0.062	**0.049**	**0.062**
		Bottom side	0.793			**0.793**	**0.793**

15.3 Product Specific Conditions

Exposure Position	1	2	3	4	1+3 Summed 1g SAR (W/kg)	1+4 Summed 1g SAR (W/kg)
	WWAN	2.4GHz WLAN	5GHz WLAN	Bluetooth		
	10g SAR (W/kg)	10g SAR (W/kg)	10g SAR (W/kg)	Estimated 10g SAR (W/kg)		
Front	-	-	1.137	0.218	**1.137**	**0.218**
Back	-	-	0.158	0.218	**0.158**	**0.218**
Left side	-	-	-	0.218	**0.000**	**0.218**
Right side	-	-	0.060	0.218	**0.060**	**0.218**
Top side	-	-	0.128	0.218	**0.128**	**0.218**
Bottom side	-	-	-	0.218	**0.000**	**0.218**

Remark:

1. According to KDB 648474 D04v01r03, for WWAN / WLAN SAR ("-") was excluded, due to Hotspot SAR was < 1.2W/kg or the distance to the edges are higher 25mm.

15.4 Body-Worn Accessory Exposure Conditions

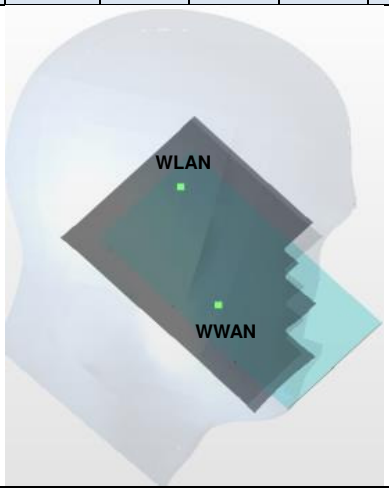
WWAN Band		Exposure Position	1	2	3	4	1+2 Summed 1g SAR (W/kg)	1+3 Summed 1g SAR (W/kg)	1+4 Summed 1g SAR (W/kg)
			WWAN	2.4GHz WLAN	5GHz WLAN	Bluetooth			
			1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)			
GSM	GSM850	Front	1.031	0.311	0.283	0.024	**1.342**	**1.314**	**1.055**
		Back	1.054	0.129	0.062	0.014	**1.183**	**1.116**	**1.068**
	GSM1900	Front	0.551	0.311	0.283	0.024	**0.862**	**0.834**	**0.575**
		Back	0.708	0.129	0.062	0.014	**0.837**	**0.770**	**0.722**
WCDMA	WCDMA II	Front	0.973	0.311	0.283	0.024	**1.284**	**1.256**	**0.997**
		Back	1.147	0.129	0.062	0.014	**1.276**	**1.209**	**1.161**
	WCDMA IV	Front	0.933	0.311	0.283	0.024	**1.244**	**1.216**	**0.957**
		Back	1.026	0.129	0.062	0.014	**1.155**	**1.088**	**1.040**
	WCDMA V	Front	1.012	0.311	0.283	0.024	**1.323**	**1.295**	**1.036**
		Back	1.005	0.129	0.062	0.014	**1.134**	**1.067**	**1.019**
LTE	LTE Band 2	Front	1.038	0.311	0.283	0.024	**1.349**	**1.321**	**1.062**
		Back	1.145	0.129	0.062	0.014	**1.274**	**1.207**	**1.159**
	LTE Band 4	Front	0.931	0.311	0.283	0.024	**1.242**	**1.214**	**0.955**
		Back	0.984	0.129	0.062	0.014	**1.113**	**1.046**	**0.998**
	LTE Band 5	Front	1.031	0.311	0.283	0.024	**1.342**	**1.314**	**1.055**
		Back	0.926	0.129	0.062	0.014	**1.055**	**0.988**	**0.940**
	LTE Band 7	Front	0.959	0.311	0.283	0.024	**1.270**	**1.242**	**0.983**
		Back	0.918	0.129	0.062	0.014	**1.047**	**0.980**	**0.932**
	LTE Band 12	Front	0.937	0.311	0.283	0.024	**1.248**	**1.220**	**0.961**
		Back	1.081	0.129	0.062	0.014	**1.210**	**1.143**	**1.095**
	LTE Band 41	Front	0.797	0.311	0.283	0.024	**1.108**	**1.080**	**0.821**
		Back	0.778	0.129	0.062	0.014	**0.907**	**0.840**	**0.792**

15.5 SPLSR Evaluation and Analysis

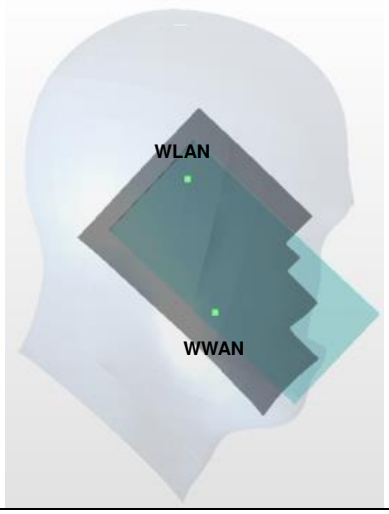
General Note:

1. SPLSR = $(SAR_1 + SAR_2)^{1.5}$ / (*min. separation distance, mm*). If SPLSR ≤ 0.04, simultaneously transmission SAR measurement is not necessary

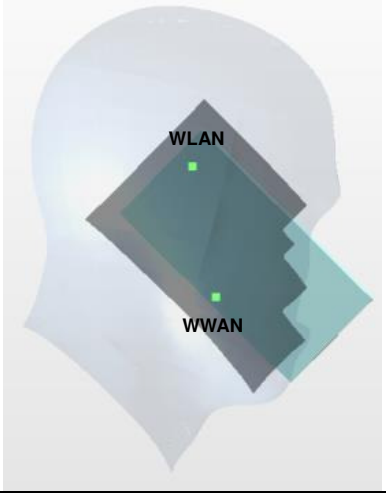
Case 1	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (cm) X	Y	Z	3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
	GSM850	Left Cheek	0.299	0	5.22	-5.71	-0.11	85.29	1.693	0.03	Not required
	2.4GHz WLAN		1.394	0	1.16	1.79	-0.16				



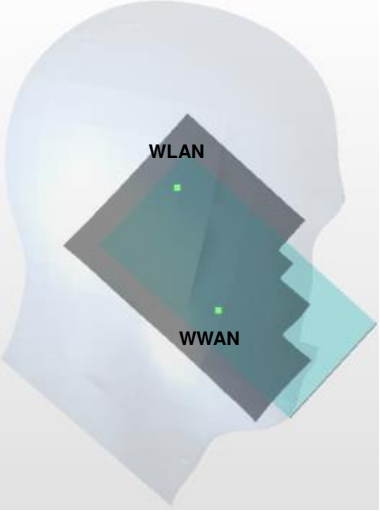
Case 2	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (cm) X	Y	Z	3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
	WCDMA II	Left Cheek	0.406	0	4.97	-6.4	0.03	90.3	1.800	0.03	Not required
	2.4GHz WLAN		1.394	0	1.16	1.79	-0.16				



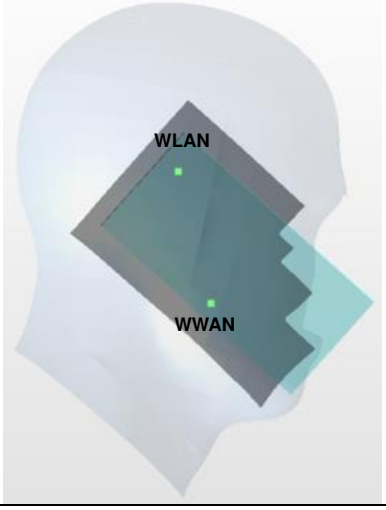
Case 3	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (cm) X	Y	Z	3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
	WCDMA IV	Left Cheek	0.285	0	5.11	-6.47	0.05	91.6	1.679	0.02	Not required
	2.4GHz WLAN		1.394	0	1.16	1.79	-0.16				



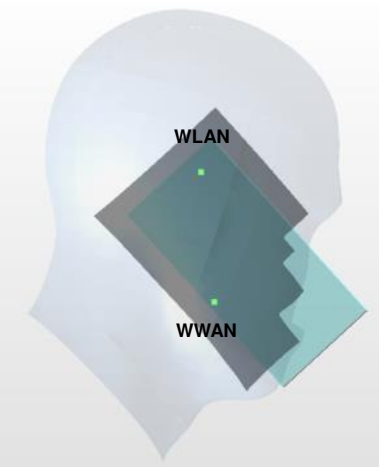
Case 4	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (cm) X	Y	Z	3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
	WCMDA V	Left Cheek	0.398	0	5.33	-5.21	-0.15	81.48	1.792	0.03	Not required
	2.4GHz WLAN		1.394	0	1.16	1.79	-0.16				



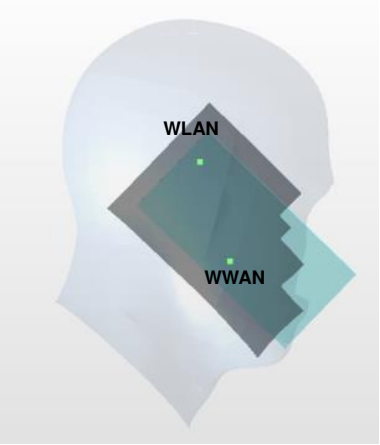
Case 5	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (cm) X	Y	Z	3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
	LTE Band 2	Left Cheek	0.387	0	4.91	-6.2	-0.01	88.3	1.781	0.03	Not required
	2.4GHz WLAN		1.394	0	1.16	1.79	-0.16				



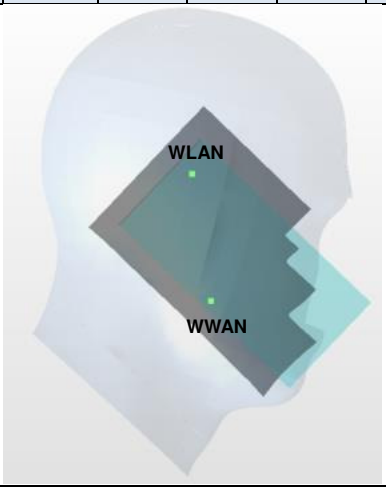
Case 6	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (cm) X	Y	Z	3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
	LTE Band 4	Left Cheek	0.308	0	5.26	-6.55	0.03	93.0	1.702	0.02	Not required
	2.4GHz WLAN		1.394	0	1.16	1.79	-0.16				



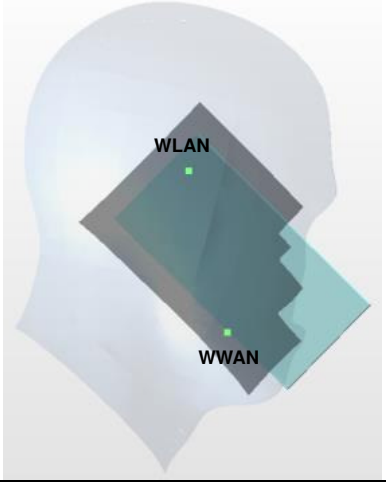
Case 7	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (cm) X	Y	Z	3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
	LTE Band 5	Left Cheek	0.339	0	5.38	-5.43	-0.11	83.63	1.733	0.03	Not required
	2.4GHz WLAN		1.394	0	1.16	1.79	-0.16				



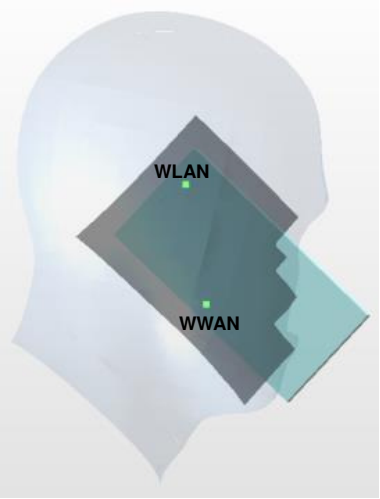
Case 8	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (cm) X	Y	Z	3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
	LTE Band 7	Left Cheek	0.281	0	4.77	-6.46	0.24	90.14	1.675	0.02	Not required
	2.4GHz WLAN		1.394	0	1.16	1.79	-0.16				



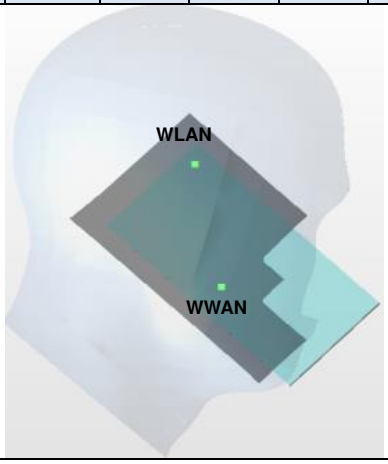
Case 9	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (cm) X	Y	Z	3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
	LTE Band 12	Left Cheek	0.267	0	7.12	-8.49	1.35	119.8	1.661	0.02	Not required
	2.4GHz WLAN		1.394	0	1.16	1.79	-0.16				



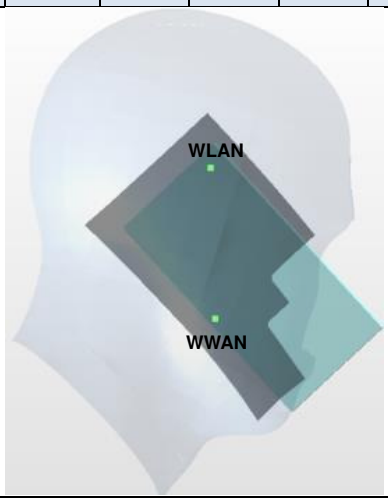
Case 10	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (cm) X	Y	Z	3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
	LTE Band 41	Left Cheek	0.212	0	4.77	-6.27	-0.02	88.3	1.606	0.02	Not required
	2.4GHz WLAN		1.394	0	1.16	1.79	-0.16				



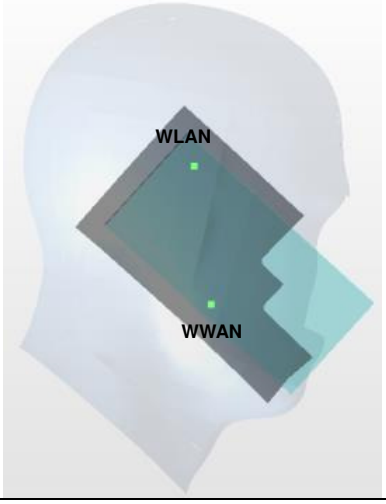
Case 11	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (cm) X	Y	Z	3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
	GSM850	Left Cheek	0.299	0	5.22	-5.71	-0.11	86.71	1.751	0.03	Not required
	5GHz WLAN		1.452	0	1.58	2.16	-0.19				



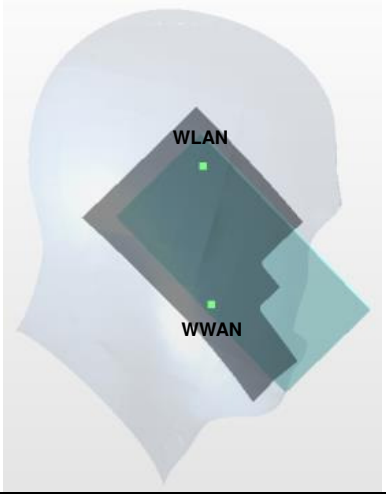
Case 12	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (cm) X	Y	Z	3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
	GSM1900	Left Cheek	0.186	0	4.83	-6.44	0.55	92.23	1.638	0.02	Not required
	5GHz WLAN		1.452	0	1.58	2.16	-0.19				



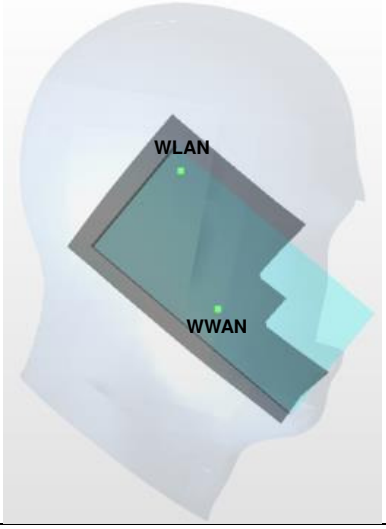
Case 13	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (cm) X	Y	Z	3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
	WCDMA II	Left Cheek	0.406	0	4.97	-6.4	0.03	92.1	1.858	0.03	Not required
	5GHz WLAN		1.452	0	1.58	2.16	-0.19				



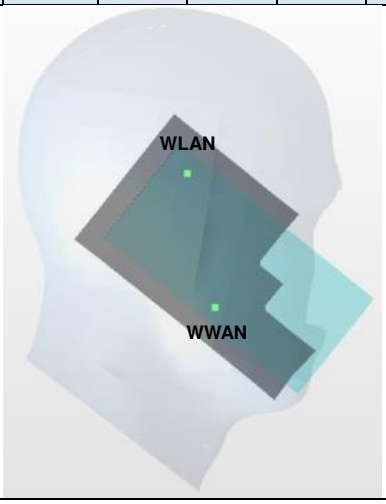
Case 14	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (cm) X	Y	Z	3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
	WCDMA IV	Left Cheek	0.285	0	5.11	-6.47	0.05	93.3	1.737	0.02	Not required
	5GHz WLAN		1.452	0	1.58	2.16	-0.19				



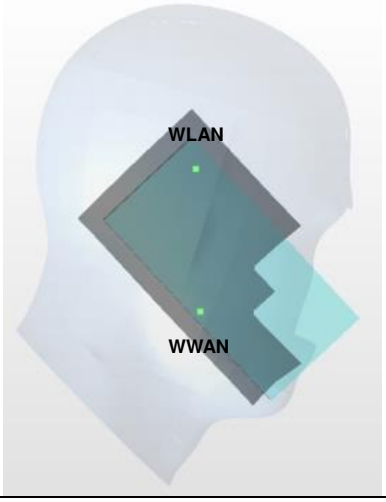
Case 15	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (cm) X	Y	Z	3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
	WCMDA V	Left Cheek	0.398	0	5.33	-5.21	-0.15	82.69	1.850	0.03	Not required
	5GHz WLAN		1.452	0	1.58	2.16	-0.19				



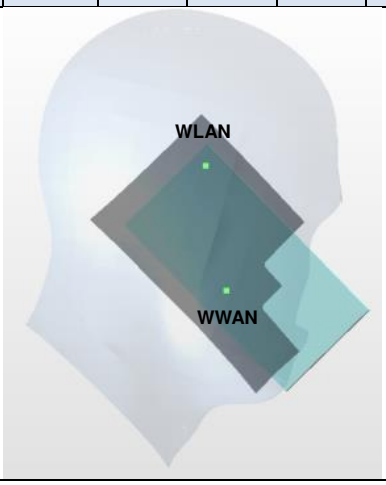
Case 16	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (cm) X	Y	Z	3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
	LTE Band 2	Left Cheek	0.387	0	4.91	-6.2	-0.01	90.0	1.839	0.03	Not required
	5GHz WLAN		1.452	0	1.58	2.16	-0.19				



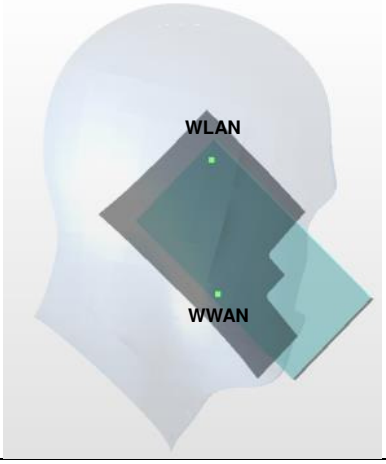
Case 17	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (cm) X	Y	Z	3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
	LTE Band 4	Left Cheek	0.308	0	5.26	-6.55	0.03	94.6	1.760	0.02	Not required
	5GHz WLAN		1.452	0	1.58	2.16	-0.19				



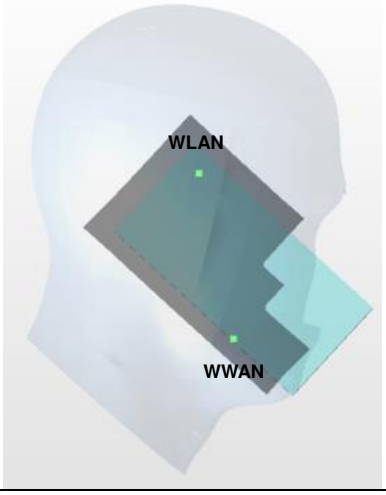
Case 18	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (cm) X	Y	Z	3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
	LTE Band 5	Left Cheek	0.339	0	5.38	-5.43	-0.11	84.88	1.791	0.03	Not required
	5GHz WLAN		1.452	0	1.58	2.16	-0.19				



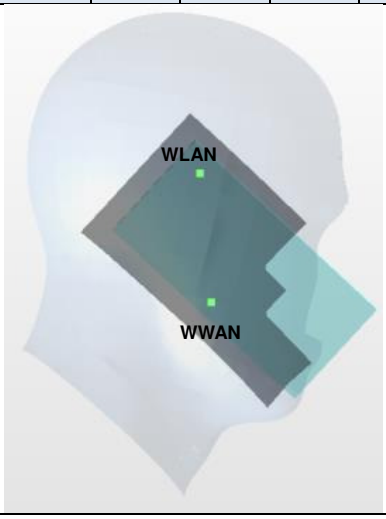
Case 19	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (cm) X	Y	Z	3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
	LTE Band 7	Left Cheek	0.281	0	4.77	-6.46	0.24	92.01	1.733	0.02	Not required
	5GHz WLAN		1.452	0	1.58	2.16	-0.19				



Case 20	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (cm) X	Y	Z	3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
	LTE Band 12	Left Cheek	0.267	0	7.12	-8.49	1.35	121.0	1.719	0.02	Not required
	5GHz WLAN		1.452	0	1.58	2.16	-0.19				



Case 21	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (cm) X	Y	Z	3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
	LTE Band 41	Left Cheek	0.212	0	4.77	-6.27	-0.02	90.1	1.664	0.02	Not required
	5GHz WLAN		1.452	0	1.58	2.16	-0.19				



Test Engineer： Nick Yu, Tom Jiang, Galen Chang, Bevis Chang, Iran Wang, Lawrence Chen, and Ken Li

16. Uncertainty Assessment

The component of uncertainly may generally be categorized according to the methods used to evaluate them. The evaluation of uncertainly by the statistical analysis of a series of observations is termed a Type An evaluation of uncertainty. The evaluation of uncertainty by means other than the statistical analysis of a series of observation is termed a Type B evaluation of uncertainty. Each component of uncertainty, however evaluated, is represented by an estimated standard deviation, termed standard uncertainty, which is determined by the positive square root of the estimated variance.

A Type A evaluation of standard uncertainty may be based on any valid statistical method for treating data. This includes calculating the standard deviation of the mean of a series of independent observations; using the method of least squares to fit a curve to the data in order to estimate the parameter of the curve and their standard deviations; or carrying out an analysis of variance in order to identify and quantify random effects in certain kinds of measurement.

A type B evaluation of standard uncertainty is typically based on scientific judgment using all of the relevant information available. These may include previous measurement data, experience, and knowledge of the behavior and properties of relevant materials and instruments, manufacture's specification, data provided in calibration reports and uncertainties assigned to reference data taken from handbooks. Broadly speaking, the uncertainty is either obtained from an outdoor source or obtained from an assumed distribution, such as the normal distribution, rectangular or triangular distributions indicated in table below.

Uncertainty Distributions	Normal	Rectangular	Triangular	U-Shape
Multi-plying Factor[(a)]	1/k[(b)]	$1/\sqrt{3}$	$1/\sqrt{6}$	$1/\sqrt{2}$

(a) standard uncertainty is determined as the product of the multiplying factor and the estimated range of variations in the measured quantity

(b) κ is the coverage factor

Table 16.1. Standard Uncertainty for Assumed Distribution

The combined standard uncertainty of the measurement result represents the estimated standard deviation of the result. It is obtained by combining the individual standard uncertainties of both Type A and Type B evaluation using the usual "root-sum-squares" (RSS) methods of combining standard deviations by taking the positive square root of the estimated variances.

Expanded uncertainty is a measure of uncertainty that defines an interval about the measurement result within which the measured value is confidently believed to lie. It is obtained by multiplying the combined standard uncertainty by a coverage factor. Typically, the coverage factor ranges from 2 to 3. Using a coverage factor allows the true value of a measured quantity to be specified with a defined probability within the specified uncertainty range. For purpose of this document, a coverage factor two is used, which corresponds to confidence interval of about 95 %. The DASY uncertainty Budget is shown in the following tables.

Error Description	Uncertainty Value (±%)	Probability	Divisor	(Ci) 1g	(Ci) 10g	Standard Uncertainty (1g) (±%)	Standard Uncertainty (10g) (±%)
Measurement System							
Probe Calibration	6.0	N	1	1	1	6.0	6.0
Axial Isotropy	4.7	R	1.732	0.7	0.7	1.9	1.9
Hemispherical Isotropy	9.6	R	1.732	0.7	0.7	3.9	3.9
Boundary Effects	1.0	R	1.732	1	1	0.6	0.6
Linearity	4.7	R	1.732	1	1	2.7	2.7
System Detection Limits	1.0	R	1.732	1	1	0.6	0.6
Modulation Response	3.2	R	1.732	1	1	1.8	1.8
Readout Electronics	0.3	N	1	1	1	0.3	0.3
Response Time	0.0	R	1.732	1	1	0.0	0.0
Integration Time	2.6	R	1.732	1	1	1.5	1.5
RF Ambient Noise	3.0	R	1.732	1	1	1.7	1.7
RF Ambient Reflections	3.0	R	1.732	1	1	1.7	1.7
Probe Positioner	0.4	R	1.732	1	1	0.2	0.2
Probe Positioning	2.9	R	1.732	1	1	1.7	1.7
Max. SAR Eval.	2.0	R	1.732	1	1	1.2	1.2
Test Sample Related							
Device Positioning	3.0	N	1	1	1	3.0	3.0
Device Holder	3.6	N	1	1	1	3.6	3.6
Power Drift	5.0	R	1.732	1	1	2.9	2.9
Power Scaling	0.0	R	1.732	1	1	0.0	0.0
Phantom and Setup							
Phantom Uncertainty	6.1	R	1.732	1	1	3.5	3.5
SAR correction	0.0	R	1.732	1	0.84	0.0	0.0
Liquid Conductivity Repeatability	0.2	N	1	0.78	0.71	0.1	0.1
Liquid Conductivity (target)	5.0	R	1.732	0.78	0.71	2.3	2.0
Liquid Conductivity (mea.)	2.5	R	1.732	0.78	0.71	1.1	1.0
Temp. unc. - Conductivity	3.4	R	1.732	0.78	0.71	1.5	1.4
Liquid Permittivity Repeatability	0.15	N	1	0.23	0.26	0.0	0.0
Liquid Permittivity (target)	5.0	R	1.732	0.23	0.26	0.7	0.8
Liquid Permittivity (mea.)	2.5	R	1.732	0.23	0.26	0.3	0.4
Temp. unc. - Permittivity	0.83	R	1.732	0.23	0.26	0.1	0.1
Combined Std. Uncertainty						11.4%	11.4%
Coverage Factor for 95 %						K=2	K=2
Expanded STD Uncertainty						22.9%	22.7%

Table 16.2. Uncertainty Budget for frequency range 300 MHz to 3 GHz

Error Description	Uncertainty Value (±%)	Probability	Divisor	(Ci) 1g	(Ci) 10g	Standard Uncertainty (1g) (±%)	Standard Uncertainty (10g) (±%)
Measurement System							
Probe Calibration	7.0	N	1	1	1	7.0	7.0
Axial Isotropy	4.7	R	1.732	0.7	0.7	1.9	1.9
Hemispherical Isotropy	9.6	R	1.732	0.7	0.7	3.9	3.9
Boundary Effects	2.0	R	1.732	1	1	1.2	1.2
Linearity	4.7	R	1.732	1	1	2.7	2.7
System Detection Limits	1.0	R	1.732	1	1	0.6	0.6
Modulation Response	3.2	R	1.732	1	1	1.8	1.8
Readout Electronics	0.3	N	1	1	1	0.3	0.3
Response Time	0.0	R	1.732	1	1	0.0	0.0
Integration Time	2.6	R	1.732	1	1	1.5	1.5
RF Ambient Noise	3.0	R	1.732	1	1	1.7	1.7
RF Ambient Reflections	3.0	R	1.732	1	1	1.7	1.7
Probe Positioner	0.4	R	1.732	1	1	0.2	0.2
Probe Positioning	6.7	R	1.732	1	1	3.9	3.9
Max. SAR Eval.	4.0	R	1.732	1	1	2.3	2.3
Test Sample Related							
Device Positioning	3.0	N	1	1	1	3.0	3.0
Device Holder	3.6	N	1	1	1	3.6	3.6
Power Drift	5.0	R	1.732	1	1	2.9	2.9
Power Scaling	0.0	R	1.732	1	1	0.0	0.0
Phantom and Setup							
Phantom Uncertainty	6.6	R	1.732	1	1	3.8	3.8
SAR correction	0.0	R	1.732	1	0.84	0.0	0.0
Liquid Conductivity Repeatability	0.2	N	1	0.78	0.71	0.1	0.1
Liquid Conductivity (target)	5.0	R	1.732	0.78	0.71	2.3	2.0
Liquid Conductivity (mea.)	2.5	R	1.732	0.78	0.71	1.1	1.0
Temp. unc. - Conductivity	3.4	R	1.732	0.78	0.71	1.5	1.4
Liquid Permittivity Repeatability	0.15	N	1	0.23	0.26	0.0	0.0
Liquid Permittivity (target)	5.0	R	1.732	0.23	0.26	0.7	0.8
Liquid Permittivity (mea.)	2.5	R	1.732	0.23	0.26	0.3	0.4
Temp. unc. - Permittivity	0.83	R	1.732	0.23	0.26	0.1	0.1
Combined Std. Uncertainty						12.8%	12.7%
Coverage Factor for 95 %						K=2	K=2
Expanded STD Uncertainty						25.5%	25.4%

Table 16.3. Uncertainty Budget for frequency range 3 GHz to 6 GHz

17. References

[1] FCC 47 CFR Part 2 “Frequency Allocations and Radio Treaty Matters; General Rules and Regulations”

[2] ANSI/IEEE Std. C95.1-1992, “IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz”, September 1992

[3] IEEE Std. 1528-2013, “IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques”, Sep 2013

[4] SPEAG DASY System Handbook

[5] FCC KDB 248227 D01 v02r02, “SAR Guidance for IEEE 802.11 (WiFi) Transmitters”, Oct 2015.

[6] FCC KDB 447498 D01 v06, “Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies”, Oct 2015

[7] FCC KDB 648474 D04 v01r03, “SAR Evaluation Considerations for Wireless Handsets”, Oct 2015.

[8] FCC KDB 941225 D01 v03r01, “3G SAR MEAUREMENT PROCEDURES”, Oct 2015

[9] FCC KDB 941225 D05 v02r05, “SAR Evaluation Considerations for LTE Devices”, Dec 2015

[10] FCC KDB 941225 D05A v01r02, “Rel. 10 LTE SAR Test Guidance and KDB Inquiries”, Oct 2015

[11] FCC KDB 941225 D06 v02r01, "SAR Evaluation Procedures for Portable Devices with Wireless Router Capabilities", Oct 2015.

[12] FCC KDB 865664 D01 v01r04, "SAR Measurement Requirements for 100 MHz to 6 GHz", Aug 2015.

[13] FCC KDB 865664 D02 v01r02, “RF Exposure Compliance Reporting and Documentation Considerations” Oct 2015.