FCC SAR TEST REPORT

FCC ID	:	IHDT56XH1
Equipment	:	Mobile Cellular Phone
Brand Name	:	Motorola
Applicant	:	Motorola Mobility LLC 222 W,Merchandise Mart Plaza, Chicago IL 60654 USA
Manufacturer	:	Motorola Mobility LLC 222 W,Merchandise Mart Plaza, Chicago IL 60654 USA
Standard	:	FCC 47 CFR Part 2 (2.1093) ANSI/IEEE C95.1-1992 IEEE 1528-2013

The product was received on Apr. 24, 2018 and testing was started from May 02, 2018 and completed on May 15, 2018. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

The report must not be used by the client to claim product certification, approval, or endorsement by TAF or any agency of government.

The test results in this variant report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERTIONAL INC. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.

Jones Tsai

Approved by: Jones Tsai / Manager

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History of this test report

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA841203-01	Rev. 01	Initial issue of report	Jun. 01, 2018
FA841203-01	Rev. 02	Update section 3.1	Jun. 04, 2018

1. Statement of Compliance

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

Equipment Class	Frequency Band	Highest SAR Summary			Highest Simultaneous Transmission 1g SAR (W/kg)
		Head (Separation 0mm)	Body-worn (Separation 5mm)	Hotspot (Separation 5mm)	
		1g SAR (W/kg)			
Licensed	GSM850	0.49	1.14	1.14	1.58
	GSM1900	0.26	0.86	0.86	
	WCDMA II	0.46	1.02	1.02	
	WCDMA V	0.23	1.08	1.08	
	LTE Band 5	0.28	1.04	1.04	
	LTE Band 7	0.76	1.15	1.15	
	LTE Band 38 / 41	0.47	1.13	1.13	
DTS	2.4GHz WLAN	1.11	0.53	0.53	1.58
DSS	Bluetooth	0.25	0.12	0.12	1.27
Date of Testing:		2018/5/2 ~ 2018/5/15			

Sporton Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code: 1190) and the FCC designation No. TW1190 under the FCC 2.948(e) by Mutual Recognition Agreement (MRA) in FCC test. This device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (4.0 W/kg) 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.

Reviewed by: Eric Huang
Report Producer: Wan Liu

2. Guidance Applied

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 D06 Hotspot Mode SAR v02r01

3. Equipment Under Test (EUT) Information

3.1 General Information

Product Feature & Specification	
Equipment Name	Mobile Cellular Phone
Brand Name	Motorola
FCC ID	IHDT56XH1
IMEI Code	SIM 1:355531090019576 SIM 2:355531090019584
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 V: 826.4 MHz ~ 846.6 MHz LTE Band 5: 824.7 MHz ~ 848.3 MHz LTE Band 7: 2502.5 MHz ~ 2567.5 MHz LTE Band 38: 2572.5 MHz ~ 2617.5 MHz LTE Band 41: 2535MHz ~ 2655 MHz WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz Bluetooth: 2402 MHz ~ 2480 MHz
Mode	GSM/GPRS/EGPRS RMC/AMR 12.2Kbps HSDPA HSUPA DC-HSDPA LTE: QPSK, 16QAM WLAN 2.4GHz : 802.11b/g/n HT20 Bluetooth BR/EDR/LE
HW Version	DVT2
SW Version	OPG28.25
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
Product Feature & Specification	

Remark:

1. The device has two SIM slots and supports Dual SIM Dual Standby. The WWAN radio transmission will be enabled by either one SIM at a time (Single active).
2. This device 2.4GHz supports Hotspot operation and Bluetooth support tethering applications.
3. When operating in a call in talk position at the head, the device utilizes the At-Head power table. When operating in a body-worn condition, with proximity of the user's body at the front or back of the device, the device operates in the Body-Worn power table. If neither the At-Head or Body-Worn condition is detected, but the device is operating in WiFi Hotspot mode, the device utilizes the Hotspot power table. When operating in any other radiated condition, the device uses the Default power table.
4. The device employs proximity sensors that detect the presence of the user's body at the front and back faces of the device. The control logic is such that, when this front or back body-worn condition is detected and the device is operating in a mode where on-body operation may be expected, the conducted power is applied in the Body-Worn power table. In this condition (user's body detected at front or back face of the device), the Body-Worn power table is applied regardless whether or not the Wi-Fi hotspot mode is active (P-sensor can't work at detecting presence of the user's body at the four edges of the device).
5. Note that the Body-Worn Reduced power tables and detection schemes described above are sufficient to assure that body-worn SAR limits are met, regardless whether the Wi-Fi hotspot feature is active or not. However, because FCC has an additional specific test definition and limit for Wi-Fi hotspot mode operation, the additional Hotspot power table is applied if hand-held operation is indicated (i.e., not At-Head or Body-Worn) when the Wi-Fi hotspot feature is active. This ensures the 4 edges of the device comply with the letter of the Wi-Fi Hotspot requirement.
6. Reduced power for different RF exposure conditions:
   Head: If audio is present at the earpiece, the device will reduce output powers on the WLAN transmitter for held-to-ear and detail descriptions of the power reduction mechanism are included in the operational description.
   Body worn: The device employs proximity sensors that detect the presence of the user's body at the front or back faces of the device, when operating in near-body condition by end user, the device will reduced maximum output powers on the GSM850 / GSM1900, WCDMA B2, LTE B7 / B38 / B41 transmitter and detail descriptions of the power reduction mechanism are included in the operational description.
   Hotspot: When the mobile hotspot session is turn on by end user, the device will reduced output powers on the GSM850 / GSM1900, WCDMA B2, LTE B7 / B38 / B41 transmitter and detail descriptions of the power reduction mechanism are included in the operational description.

3.2 General LTE SAR Test and Reporting Considerations

Summarized necessary items addressed in KDB 941225 D05 v02r05	
FCC ID	IHDT56XH1
Equipment Name	Mobile Cellular Phone
Operating Frequency Range of each LTE transmission band	LTE Band 5: 824.7 MHz ~ 848.3 MHz LTE Band 7: 2502.5 MHz ~ 2567.5 MHz LTE Band 38: 2572.5 MHz ~ 2617.5 MHz LTE Band 41: 2498.5 MHz ~ 2687.5 MHz
Channel Bandwidth	LTE Band 05:1.4MHz, 3MHz, 5MHz, 10MHz LTE Band 07: 5MHz, 10MHz, 15MHz, 20MHz LTE Band 38: 5MHz, 10MHz, 15MHz, 20MHz LTE Band 41: 5MHz, 10MHz, 15MHz, 20MHz
uplink modulations used	QPSK / 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 1, 2 and 3

Modulation	Channel bandwidth / Transmission bandwidth (N_{RB})						MPR (dB)
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1
16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2
64 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 2
64 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 3
256 QAM	≥ 1						≤ 5

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 or Near-body that LTE B7 / B38 / B41 power reduction applied to satisfy SAR compliance.

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

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 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

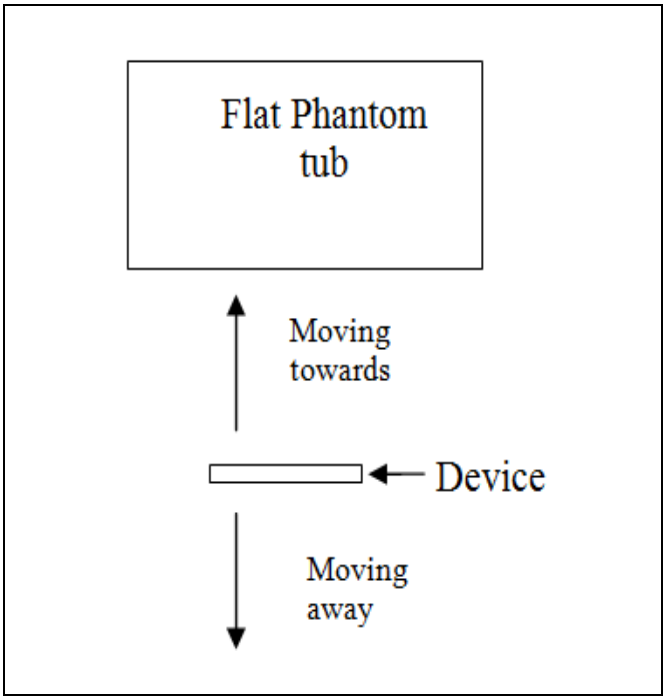
LTE Band 41

	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	40065	2537.5	40090	2540	40115	2542.5	40140	2545
L M	40385	2569.5	40390	2570	10395	2570.5	40400	2571
H M	40705	2601.5	40690	2600	40685	2599.5	40670	2598
H	41215	2652.5	41190	2650	41165	2647.5	41140	2645

3.3 Proximity Sensor Triggering Test

<Proximity Sensor Triggering Distance>:

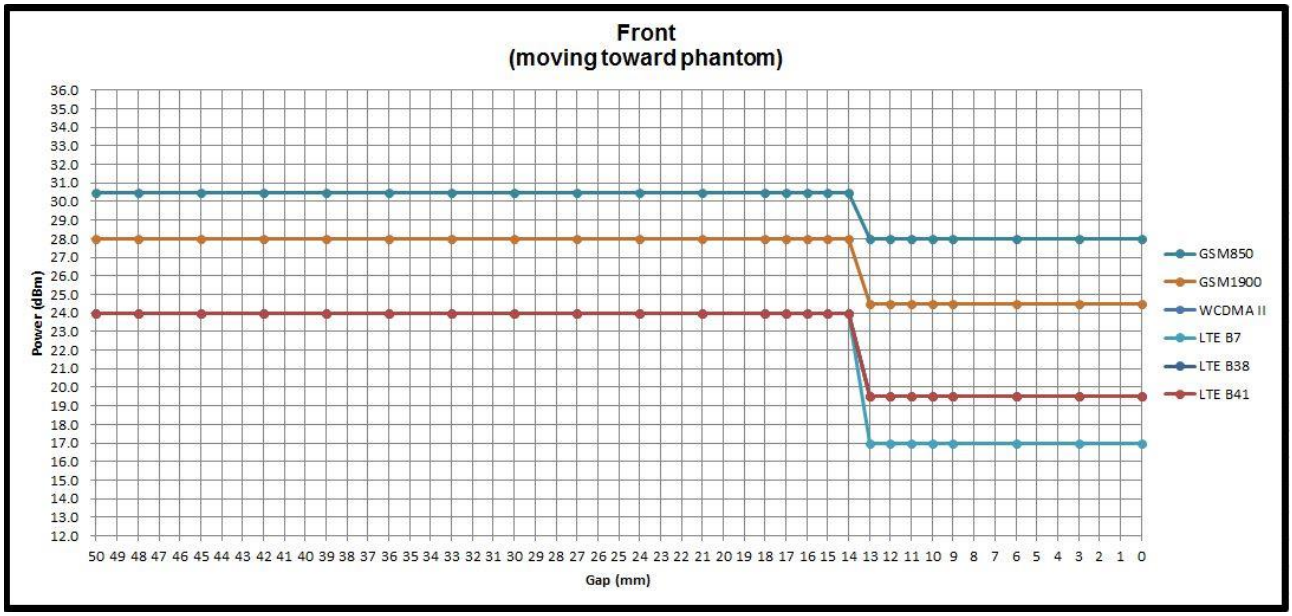
1. Proximity sensor triggering distance testing was performed according to the procedures outlined in KDB 616217 D04 section 6.2, and EUT moving further away from the flat phantom and EUT moving toward the flat phantom were both assessed and the tissue-equivalent medium for highest frequency (2600MHz) and lowest (750MHz) frequency was used for proximity sensor triggering testing.
2. Capacitive proximity sensors placed coincident with antenna elements at the top and bottom ends of the phone are utilized to determine when the device comes in proximity of the user's body at the front or back of the device.
3. The output power will reduce to body worn power level when top and bottom sensor pad be detected.
4. The sensors used to detect the proximity of the user's body at the front or back surface of the device use a detection threshold distance. The data shown in the sections below shows the distance(s).
5. When the sensor is active, the device will reduced maximum output powers on the GSM850 / GSM1900, WCDMA B2, LTE B7 / B38 / B41 transmitter.

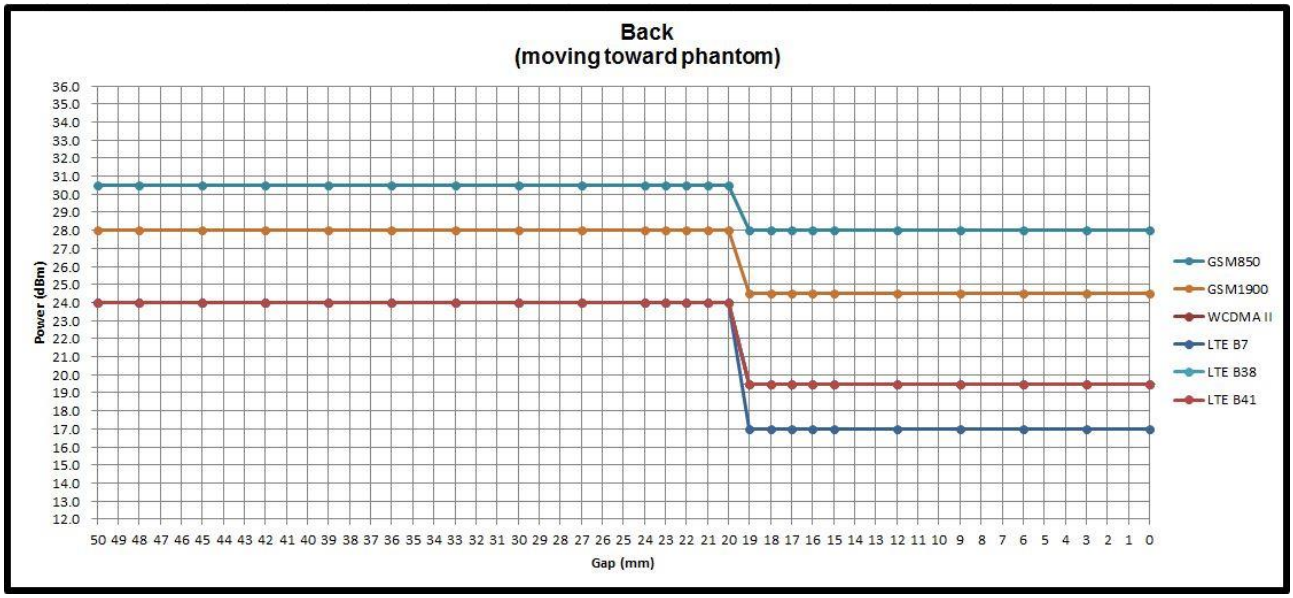


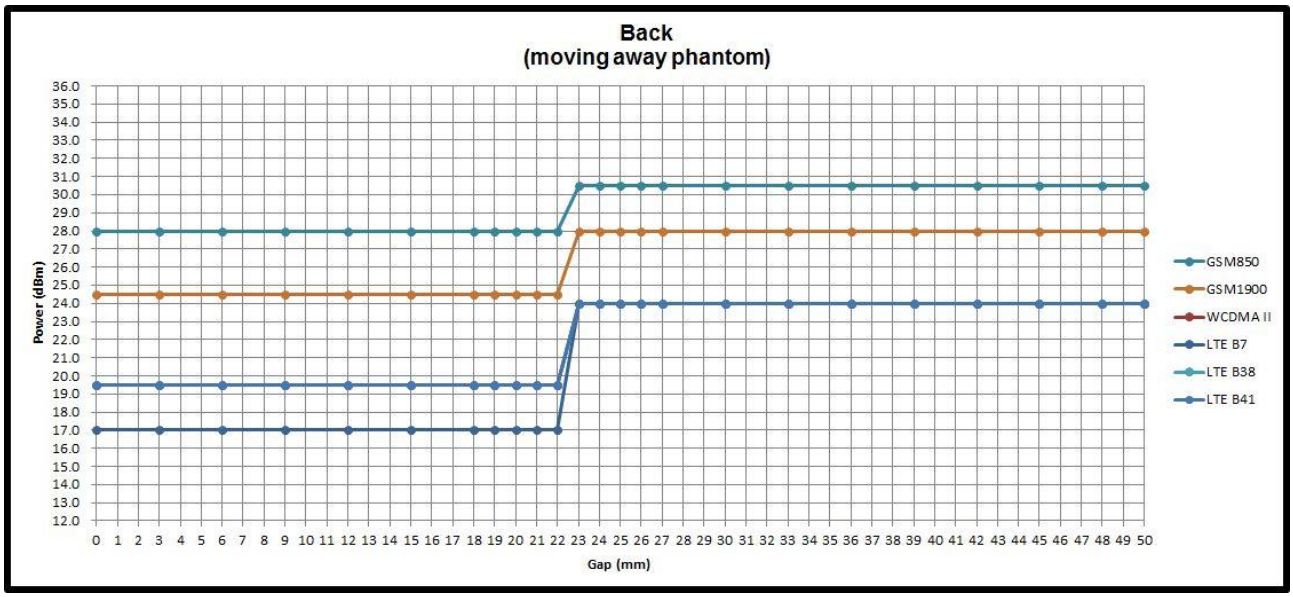
Sensor detection test set-up, front and back faces

Proximity Sensor Trigger Distance (mm)				
Position	Front		Back	
Position	Moving towards	Moving away	Moving towards	Moving away
Minimum	13	17	19	22

<Sensor triggers distance V.S Measure power>




Back
(moving toward phantom)
Power (dBm)
Gap (mm)
GSM850
GSM1900
WCDMA II
LTE B7
LTE B38
LTE B41


Back
(moving away phantom)
Power (dBm)
Gap (mm)
GSM850
GSM1900
WCDMA II
LTE B7
LTE B38
LTE B41

4. RF Exposure Limits

4.1 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.

4.2 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.

5. Specific Absorption Rate (SAR)

5.1 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.

5.2 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:

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

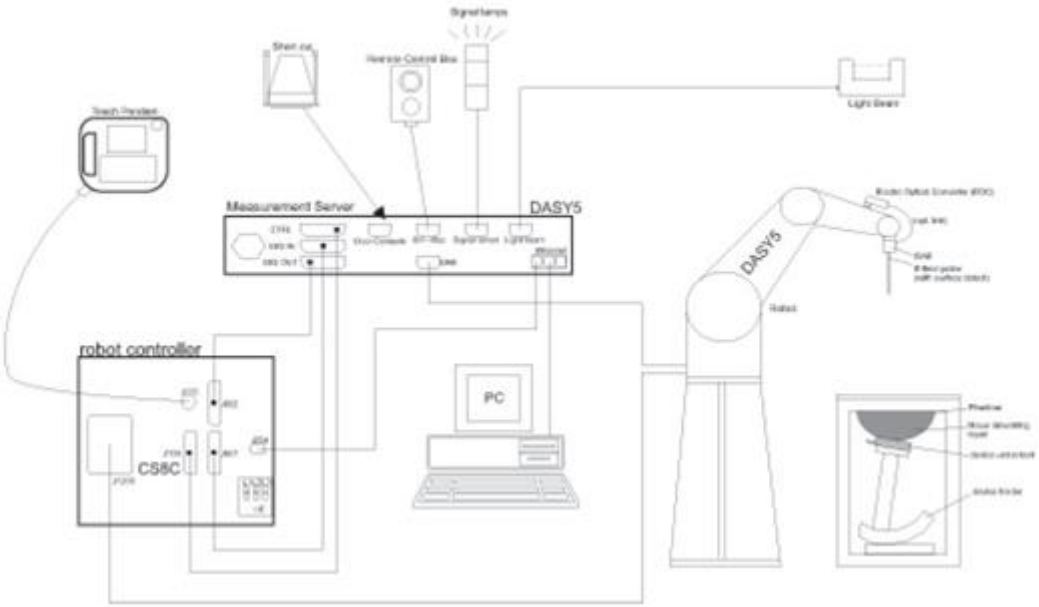
SAR is expressed in units of Watts per kilogram (W/kg)

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

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

6. 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.

6.1 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	

6.2 Data Acquisition Electronics (DAE)

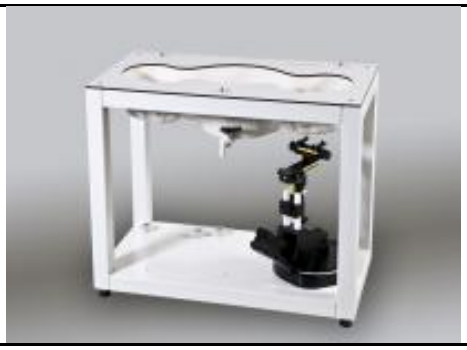
The data acquisition electronics (DAE) consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit. Transmission to the measurement server is accomplished through an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

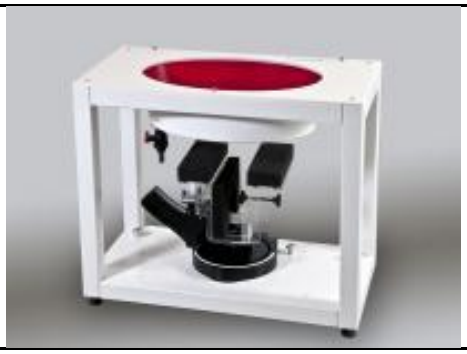
6.3 Phantom

<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.

6.4 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

7. 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 Appendix D 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

7.1 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

7.2 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.

7.3 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.	

7.4 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.

7.5 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.

7.6 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.

8. Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
SPEAG	835MHz System Validation Kit	D835V2	4d167	Feb. 27, 2018	Feb. 26, 2019
SPEAG	1900MHz System Validation Kit	D1900V2	5d041	Sep. 28, 2017	Sep. 27, 2018
SPEAG	2450MHz System Validation Kit	D2450V2	736	Sep. 18, 2017	Sep. 17, 2018
SPEAG	2600MHz System Validation Kit	D2600V2	1008	Sep. 18, 2017	Sep. 17, 2018
SPEAG	Data Acquisition Electronics	DAE4	1424	Jan. 18, 2018	Jan. 17, 2019
SPEAG	Data Acquisition Electronics	DAE4	1399	Nov. 16, 2017	Nov. 15, 2018
SPEAG	Data Acquisition Electronics	DAE4	778	May. 22, 2017	May. 21, 2018
SPEAG	Data Acquisition Electronics	DAE4	853	Jul. 19, 2017	Jul. 18, 2018
SPEAG	Dosimetric E-Field Probe	EX3DV4	3925	May. 24, 2017	May. 23, 2018
SPEAG	Dosimetric E-Field Probe	ES3DV3	3270	Sep. 25, 2017	Sep. 24, 2018
SPEAG	Dosimetric E-Field Probe	EX3DV4	3931	Sep. 29, 2017	Sep. 28, 2018
SPEAG	Dosimetric E-Field Probe	ES3DV3	3169	May. 11, 2017	May. 10, 2018
Gencom	Thermometer	TE1	TM685-1	Mar. 16, 2018	Mar. 15, 2019
Gencom	Thermometer	TE1	TM685-2	Mar. 16, 2018	Mar. 15, 2019
WonDer	Thermometer	WD-5016	TM642-1	Mar. 16, 2018	Mar. 15, 2019
WonDer	Thermometer	WD-5016	TM642-2	Mar. 16, 2018	Mar. 15, 2019
Anritsu	Radio Communication Analyzer	MT8821C	6201341950	Apr. 17, 2018	Apr. 16, 2019
Agilent	Wireless Communication Test Set	E5515C	MY50266977	May. 30, 2017	May. 29, 2018
R&S	BT Base Station	CBT	100815	Feb. 05, 2018	Feb. 04, 2019
SPEAG	Device Holder	N/A	N/A	N/A	N/A
Anritsu	Signal Generator	MG3710A	6201502524	Dec. 07, 2017	Dec. 06, 2018
Agilent	ENA Network Analyzer	E5071C	MY46316648	Jan. 17, 2018	Jan. 16, 2019
SPEAG	Dielectric Probe Kit	DAK-3.5	1126	Sep. 26, 2017	Sep. 25, 2018
LINE SEIKI	Digital Thermometer	LKMelectronic	DTM3000SPEZIAL	Sep. 06, 2017	Sep. 05, 2018
Anritsu	Power Meter	ML2495A	932001	Sep. 26, 2017	Sep. 25, 2018
Anritsu	Power Sensor	MA2411B	846202	Sep. 26, 2017	Sep. 25, 2018
Anritsu	Power Meter	ML2495A	1218006	Oct. 06, 2017	Oct. 05, 2018
Anritsu	Power Sensor	MA2411B	1207363	Oct. 06, 2017	Oct. 05, 2018
Agilent	Spectrum Analyzer	E4408B	MY44211028	Aug. 23, 2017	Aug. 22, 2018
Anritsu	Spectrum Analyzer	MS2830A	6201396378	Jun. 26, 2017	Jun. 25, 2018
Mini-Circuits	Power Amplifier	ZVE-8G+	D120604	Mar. 12, 2018	Mar. 11, 2019
Mini-Circuits	Power Amplifier	ZHL-42W+	QA1344002	Mar. 12, 2018	Mar. 11, 2019
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	

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.

9. System Verification

9.1 Tissue Simulating Liquids

For the measurement of the field distribution inside the SAM phantom with DASY, the phantom must be filled with around 25 liters of homogeneous body tissue simulating liquid. For head SAR testing, the liquid height from the ear reference point (ERP) of the phantom to the liquid top surface is larger than 15 cm, which is shown in Fig. 10.1. For body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15 cm, which is shown in Fig. 10.2.

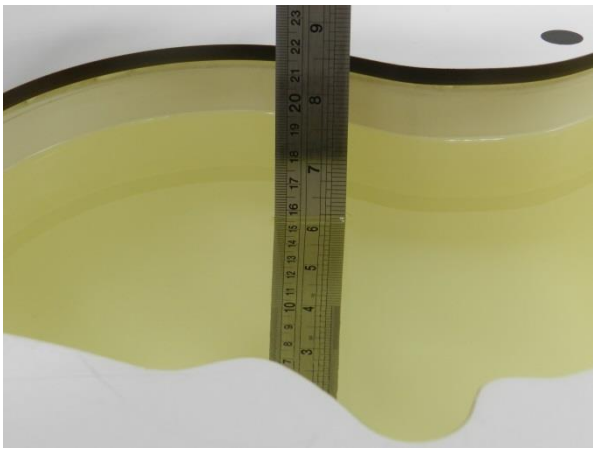


Fig 10.1Photo of Liquid Height for Head SAR

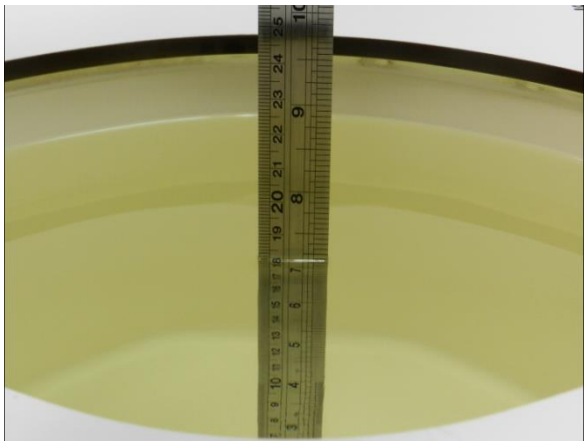


Fig 10.2 Photo of Liquid Height for Body SAR

9.2 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
835	HSL	22.7	0.918	41.468	0.90	41.50	2.00	-0.08	±5	2018/5/3
835	MSL	22.7	0.960	55.236	0.97	55.20	-1.03	0.07	±5	2018/5/8
835	MSL	22.6	0.956	55.176	0.97	55.20	-1.44	-0.04	±5	2018/5/12
1900	HSL	22.7	1.411	40.619	1.40	40.00	0.79	1.55	±5	2018/5/3
1900	MSL	22.5	1.577	53.592	1.52	53.30	3.75	0.55	±5	2018/5/14
2450	HSL	22.4	1.791	38.525	1.80	39.20	-0.50	-1.72	±5	2018/5/10
2450	HSL	22.6	1.834	38.719	1.80	39.20	1.89	-1.23	±5	2018/5/15
2450	MSL	22.5	1.881	52.707	1.95	52.70	-3.54	0.01	±5	2018/5/2
2450	MSL	22.6	1.980	53.459	1.95	52.70	1.54	1.44	±5	2018/5/15
2600	HSL	22.3	1.926	37.841	1.96	39.00	-1.73	-2.97	±5	2018/5/7
2600	MSL	22.7	2.161	51.517	2.16	52.50	0.05	-1.87	±5	2018/5/13

9.3 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 (%)
2018/5/3	835	HSL	250	D835V2-4d167	EX3DV4 - SN3931	DAE4 Sn1399	2.52	9.26	10.08	8.86
2018/5/8	835	MSL	250	D835V2-4d167	ES3DV3 - SN3169	DAE4 Sn853	2.45	9.62	9.8	1.87
2018/5/12	835	MSL	250	D835V2-4d167	ES3DV3 - SN3270	DAE4 Sn853	2.32	9.62	9.28	-3.53
2018/5/3	1900	HSL	250	D1900V2-5d041	EX3DV4 - SN3931	DAE4 Sn1399	10.70	40.50	42.8	5.68
2018/5/14	1900	MSL	250	D1900V2-5d041	ES3DV3 - SN3270	DAE4 Sn853	9.76	40.70	39.04	-4.08
2018/5/10	2450	HSL	250	D2450V2-736	ES3DV3 - SN3270	DAE4 Sn778	12.90	52.40	51.6	-1.53
2018/5/15	2450	HSL	250	D2450V2-736	EX3DV4 - SN3925	DAE4 Sn1424	12.70	52.40	50.8	-3.05
2018/5/2	2450	MSL	250	D2450V2-736	ES3DV3 - SN3169	DAE4 Sn853	13.20	50.80	52.8	3.94
2018/5/15	2450	MSL	250	D2450V2-736	EX3DV4 - SN3925	DAE4 Sn1424	13.40	50.80	53.6	5.51
2018/5/7	2600	HSL	250	D2600V2-1008	ES3DV3 - SN3169	DAE4 Sn853	14.10	56.80	56.4	-0.70
2018/5/13	2600	MSL	250	D2600V2-1008	EX3DV4 - SN3931	DAE4 Sn1399	13.80	55.00	55.2	0.36

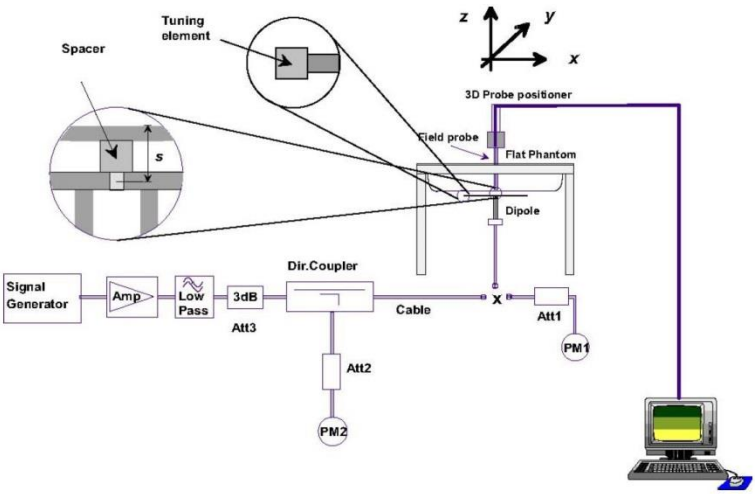


Fig 8.3.1 System Performance Check Setup

Fig 8.3.2 Setup Photo

10. RF Exposure Positions

10.1 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.

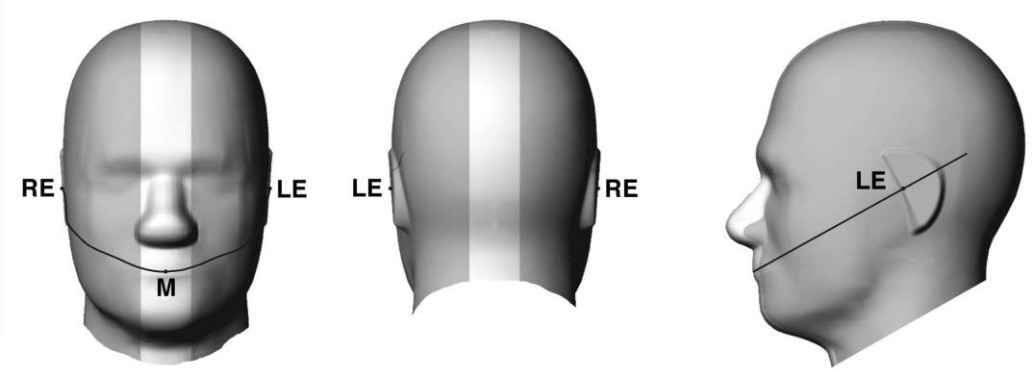


Fig 9.1.1 Front, back, and side views of SAM twin phantom

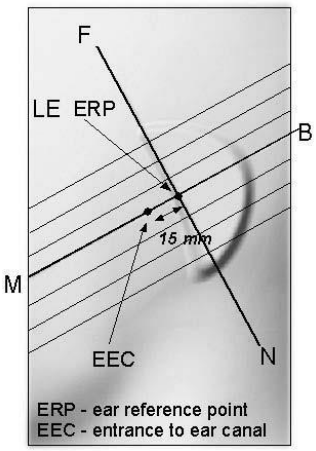


Fig 9.1.2 Close-up side view of phantom showing the ear region.

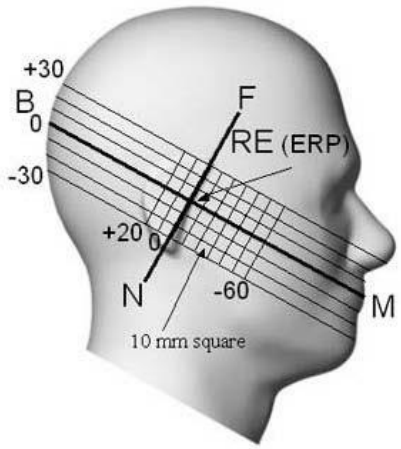


Fig 9.1.3 Side view of the phantom showing relevant markings and seven cross-sectional plane locations

10.2 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.

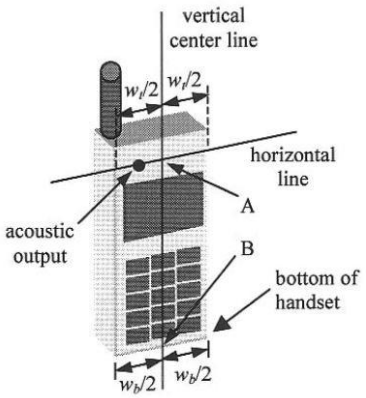


Fig 9.2.1 Handset vertical and horizontal reference lines—"fixed case

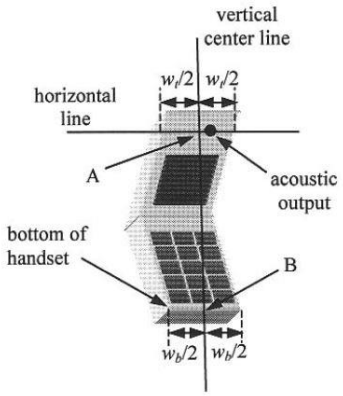


Fig 9.2.2 Handset vertical and horizontal reference lines—"clam-shell case"

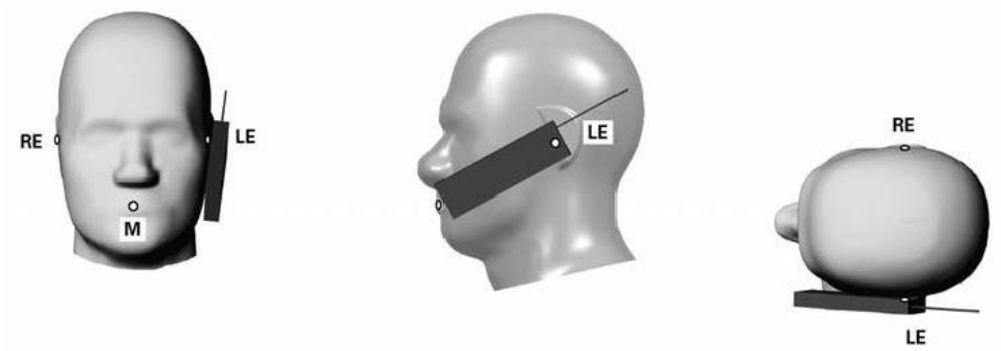


Fig 9.2.3 cheek or touch position. The reference points for the right ear (RE), left ear (LE), and mouth (M), which establish the Reference Plane for handset positioning, are indicated.

10.3 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

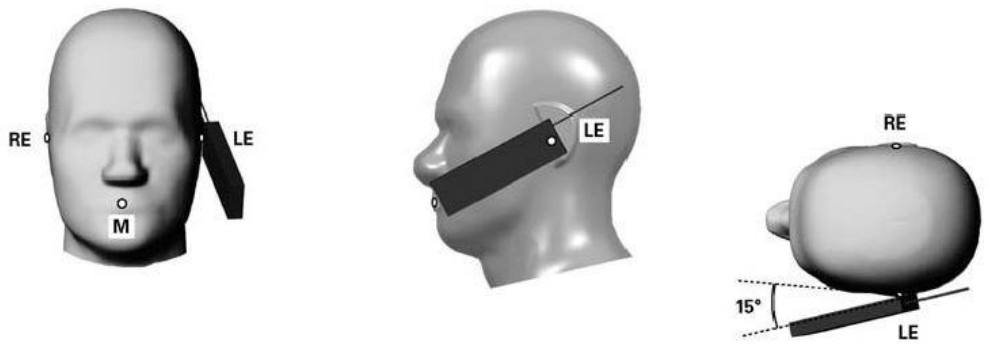


Fig 9.3.1 Tilt position. The reference points for the right ear (RE), left ear (LE), and mouth (M), which define the Reference Plane for handset positioning, are indicated.

10.4 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.

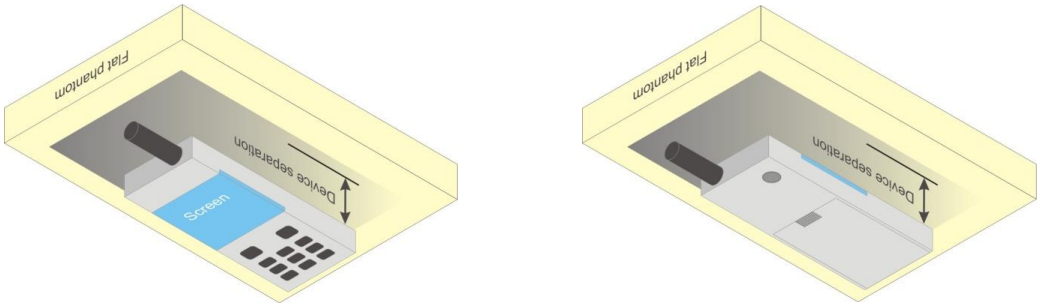


Fig 9.4 Body Worn Position

10.5 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. Conducted RF Output Power (Unit: dBm)

<GSM Conducted Power>

General Note:

1. Per KDB 447498 D01v06, the maximum output power channel is used for SAR testing and for further SAR test reduction.
2. Per KDB 941225 D01v03r01, for SAR test reduction for GSM / GPRS / EDGE modes is determined by the source-based time-averaged output power including tune-up tolerance. The mode with highest specified time-averaged output power should be tested for SAR compliance in the applicable exposure conditions. For modes with the same specified maximum output power and tolerance, the higher number time-slot configuration should be tested. Therefore, the GPRS (4Tx slots) for GSM850/GSM1900 are considered as the primary mode.
3. Other configurations of GSM / GPRS / EDGE are considered as secondary modes. The 3G SAR test reduction procedure is applied, when the maximum output power and tune-up tolerance specified for production units in a secondary mode is ≤ ¼ dB higher than the primary mode, SAR measurement is not required for the secondary mode

<Default Power Mode>

GSM850	Burst Average Power (dBm)			Tune-up Limit (dBm)	Frame-Average Power (dBm)			Tune-up Limit (dBm)
TX Channel	128	189	251		128	189	251	
Frequency (MHz)	824.2	836.4	848.8		824.2	836.4	848.8	
GSM 1 Tx slot	33.17	33.51	33.37	34.00	24.17	24.51	24.37	25.00
GPRS 1 Tx slot	33.25	33.50	33.43	34.00	24.25	24.50	24.43	25.00
GPRS 2 Tx slots	31.89	31.98	31.83	32.50	25.89	25.98	25.83	26.50
GPRS 3 Tx slots	30.37	30.49	30.32	31.50	26.11	26.23	26.06	27.24
GPRS 4 Tx slots	28.92	28.96	28.86	30.50	25.92	25.96	25.86	27.50
EDGE 1 Tx slot	26.47	26.65	26.61	27.50	17.47	17.65	17.61	18.50
EDGE 2 Tx slots	25.23	25.45	25.46	26.50	19.23	19.45	19.46	20.50
EDGE 3 Tx slots	24.16	24.23	24.22	25.50	19.90	19.97	19.96	21.24
EDGE 4 Tx slots	22.95	22.97	22.94	24.00	19.95	19.97	19.94	21.00

GSM1900	Burst Average Power (dBm)			Tune-up Limit (dBm)	Frame-Average Power (dBm)			Tune-up Limit (dBm)
TX Channel	512	661	810		512	661	810	
Frequency (MHz)	1850.2	1880	1909.8		1850.2	1880	1909.8	
GSM 1 Tx slot	29.75	29.81	29.91	31.00	20.75	20.81	20.91	22.00
GPRS 1 Tx slot	29.87	29.82	29.90	31.00	20.87	20.82	20.90	22.00
GPRS 2 Tx slots	28.50	28.48	28.39	30.00	22.50	22.48	22.39	24.00
GPRS 3 Tx slots	27.15	27.50	27.34	29.00	22.89	23.24	23.08	24.74
GPRS 4 Tx slots	26.32	26.21	26.13	28.00	23.32	23.21	23.13	25.00
EDGE 1 Tx slot	25.92	25.86	25.88	27.50	16.92	16.86	16.88	18.50
EDGE 2 Tx slots	24.99	24.98	24.97	26.50	18.99	18.98	18.97	20.50
EDGE 3 Tx slots	22.42	22.34	22.32	24.00	18.16	18.08	18.06	19.74
EDGE 4 Tx slots	21.90	21.80	21.78	23.50	18.90	18.80	18.78	20.50

<Hotspot / Near-body Power Mode>

GSM850	Burst Average Power (dBm)			Tune-up Limit (dBm)	Frame-Average Power (dBm)			Tune-up Limit (dBm)
TX Channel	128	189	251		128	189	251	
Frequency (MHz)	824.2	836.4	848.8		824.2	836.4	848.8	
GSM 1 Tx slot	30.10	30.35	30.50	30.50	21.10	21.35	21.50	21.50
GPRS 1 Tx slot	30.04	30.37	30.50	30.50	21.04	21.37	21.50	21.50
GPRS 2 Tx slots	29.15	29.16	29.16	30.00	23.15	23.16	23.16	24.00
GPRS 3 Tx slots	27.86	27.71	27.84	29.00	23.60	23.45	23.58	24.74
GPRS 4 Tx slots	26.79	26.60	26.49	28.00	23.79	23.60	23.49	25.00
EDGE 1 Tx slot	26.47	26.65	26.61	27.50	17.47	17.65	17.61	18.50
EDGE 2 Tx slots	25.23	25.45	25.46	26.50	19.23	19.45	19.46	20.50
EDGE 3 Tx slots	24.16	24.23	24.22	25.50	19.90	19.97	19.96	21.24
EDGE 4 Tx slots	22.95	22.97	22.94	24.00	19.95	19.97	19.94	21.50

GSM1900	Burst Average Power (dBm)			Tune-up Limit (dBm)	Frame-Average Power (dBm)			Tune-up Limit (dBm)
TX Channel	512	661	810		512	661	810	
Frequency (MHz)	1850.2	1880	1909.8		1850.2	1880	1909.8	
GSM 1 Tx slot	26.85	27.13	27.30	27.50	17.85	18.13	18.30	18.50
GPRS 1 Tx slot	26.87	27.14	27.30	27.50	17.87	18.14	18.30	18.50
GPRS 2 Tx slots	25.73	25.81	25.94	26.50	19.73	19.81	19.94	20.50
GPRS 3 Tx slots	24.47	24.74	24.78	25.50	20.21	20.48	20.52	21.24
GPRS 4 Tx slots	24.20	24.32	24.45	24.50	21.20	21.32	21.45	21.50
EDGE 1 Tx slot	25.92	25.86	25.88	27.50	16.92	16.86	16.88	18.50
EDGE 2 Tx slots	24.99	24.98	24.97	26.50	18.99	18.98	18.97	20.50
EDGE 3 Tx slots	22.42	22.34	22.32	24.00	18.16	18.08	18.06	19.74
EDGE 4 Tx slots	21.90	21.80	21.78	23.50	18.90	18.80	18.78	20.50

<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 4) (Note 5)	β_{ed} (SF)	β_{ed} (Codes)	CM (dB) (Note 2)	MPR (dB) (Note 2) (Note 6)	AG Index (Note 5)	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	0	-	-	5/15	5/15	47/15	4	1	1.0	0.0	12	67

Note 1: For sub-test 1 to 4, Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 30/15 with β_{hs} = 30/15 * β_c . For sub-test 5, Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 5/15 with β_{hs} = 5/15 * 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: 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 5: β_{ed} can not be set directly; it is set by Absolute Grant Value.

Note 6: For subtests 2, 3 and 4, UE may perform E-DPDCH power scaling at max power which could results in slightly smaller MPR values.

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.		

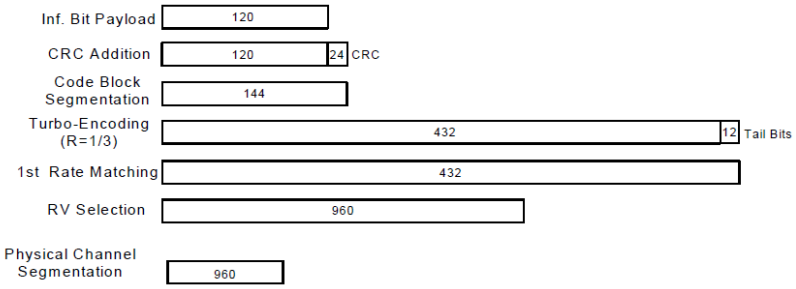


Figure C.8.19: Coding rate for Fixed reference Channel H-Set 12 (QPSK)

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. 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, and according to the following RF output power, the output power results of the secondary modes (HSUPA, HSDPA, DC-HSDPA) are less than ¼ dB higher than the primary modes; therefore, SAR measurement is not required for HSDPA / HSUPA / DC-HSDPA.

<Default Power Mode>

Band		WCDMA II			Tune-up Limit (dBm)	WCDMA V			Tune-up Limit (dBm)
TX Channel		9262	9400	9538		4132	4182	4233	
Rx Channel		9662	9800	9938		4357	4407	4458	
Frequency (MHz)		1852.4	1880	1907.6		826.4	836.4	846.6	
3GPP Rel 99	AMR 12.2Kbps	23.30	23.41	23.39	24.00	23.42	23.36	23.40	24.00
3GPP Rel 99	RMC 12.2Kbps	23.32	23.44	23.42	24.00	23.46	23.39	23.45	24.00
3GPP Rel 6	HSDPA Subtest-1	22.38	22.43	22.49	23.00	22.51	22.43	22.51	23.00
3GPP Rel 6	HSDPA Subtest-2	22.32	22.37	22.48	23.00	22.43	22.35	22.51	23.00
3GPP Rel 6	HSDPA Subtest-3	21.81	21.81	21.90	22.50	21.83	21.85	21.98	22.50
3GPP Rel 6	HSDPA Subtest-4	21.83	21.89	21.84	22.50	21.78	21.89	21.94	22.50
3GPP Rel 8	DC-HSDPA Subtest-1	22.31	22.37	22.46	23.00	22.42	22.40	22.44	23.00
3GPP Rel 8	DC-HSDPA Subtest-2	22.25	22.36	22.37	23.00	22.41	22.37	22.47	23.00
3GPP Rel 8	DC-HSDPA Subtest-3	21.76	21.85	21.90	22.50	21.77	21.83	21.89	22.50
3GPP Rel 8	DC-HSDPA Subtest-4	21.72	21.85	21.90	22.50	21.75	21.80	21.89	22.50
3GPP Rel 6	HSUPA Subtest-1	22.25	22.43	22.15	23.00	22.08	22.27	22.36	23.00
3GPP Rel 6	HSUPA Subtest-2	20.91	21.00	20.99	21.00	20.86	20.92	20.93	21.00
3GPP Rel 6	HSUPA Subtest-3	21.29	21.49	21.16	22.00	21.00	21.23	21.22	22.00
3GPP Rel 6	HSUPA Subtest-4	20.82	20.93	20.86	21.00	20.82	20.90	20.92	21.00
3GPP Rel 6	HSUPA Subtest-5	22.31	22.42	22.38	23.00	22.40	22.46	22.49	23.00

<Hotspot / Near-body Power Mode>

Band		WCDMA II			Tune-up Limit (dBm)
TX Channel		9262	9400	9538	
Rx Channel		9662	9800	9938	
Frequency (MHz)		1852.4	1880	1907.6	
3GPP Rel 99	AMR 12.2Kbps	19.48	19.49	19.45	19.50
3GPP Rel 99	RMC 12.2Kbps	19.48	19.50	19.47	19.50
3GPP Rel 6	HSDPA Subtest-1	18.16	18.44	18.29	18.50
3GPP Rel 6	HSDPA Subtest-2	18.19	18.37	18.33	18.50
3GPP Rel 6	HSDPA Subtest-3	17.78	17.89	17.75	18.00
3GPP Rel 6	HSDPA Subtest-4	17.80	17.89	17.76	18.00
3GPP Rel 8	DC-HSDPA Subtest-1	18.30	18.45	18.50	18.50
3GPP Rel 8	DC-HSDPA Subtest-2	18.34	18.46	18.46	18.50
3GPP Rel 8	DC-HSDPA Subtest-3	17.72	17.76	17.82	18.00
3GPP Rel 8	DC-HSDPA Subtest-4	17.64	17.87	17.85	18.00
3GPP Rel 6	HSUPA Subtest-1	18.26	17.86	17.62	18.50
3GPP Rel 6	HSUPA Subtest-2	16.43	16.10	16.48	16.50
3GPP Rel 6	HSUPA Subtest-3	17.19	17.05	16.56	17.50
3GPP Rel 6	HSUPA Subtest-4	16.46	16.35	16.42	16.50
3GPP Rel 6	HSUPA Subtest-5	18.28	18.01	17.88	18.50

<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 B5 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 band 38 SAR test was covered by Band 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 5>

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				20450	20525	20600		
Frequency (MHz)				829	836.5	844		
10	QPSK	1	0	22.73	22.74	22.82	24	0
10	QPSK	1	25	23.24	23.27	23.18		
10	QPSK	1	49	22.71	22.82	22.80		
10	QPSK	25	0	22.03	22.26	22.08	23	1
10	QPSK	25	12	22.09	22.10	22.20		
10	QPSK	25	25	22.01	22.11	22.13		
10	QPSK	50	0	22.09	22.04	22.19		
10	16QAM	1	0	21.61	21.58	21.51	23	1
10	16QAM	1	25	21.87	22.19	21.69		
10	16QAM	1	49	21.46	21.57	21.55		
10	16QAM	25	0	21.09	21.14	21.21	22	2
10	16QAM	25	12	21.15	21.16	21.17		
10	16QAM	25	25	21.07	20.96	21.20		
10	16QAM	50	0	21.15	21.01	21.21		
Channel				20425	20525	20625	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				826.5	836.5	846.5		
5	QPSK	1	0	22.67	22.60	22.91	24	0
5	QPSK	1	12	23.07	22.89	23.00		
5	QPSK	1	24	22.79	22.65	22.60		
5	QPSK	12	0	21.90	21.81	22.01	23	1
5	QPSK	12	7	21.94	21.92	22.05		
5	QPSK	12	13	21.87	21.88	21.88		
5	QPSK	25	0	21.86	21.95	21.95		
5	16QAM	1	0	21.43	21.97	22.05	23	1
5	16QAM	1	12	22.15	22.31	21.69		
5	16QAM	1	24	21.97	21.41	21.83		
5	16QAM	12	0	20.93	20.73	21.04	22	2
5	16QAM	12	7	20.89	20.70	21.00		
5	16QAM	12	13	20.93	20.65	20.83		
5	16QAM	25	0	20.86	20.88	20.73		
Channel				20415	20525	20635	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				825.5	836.5	847.5		
3	QPSK	1	0	22.75	22.72	22.93	24	0
3	QPSK	1	8	22.70	22.71	22.93		
3	QPSK	1	14	22.82	22.69	22.82		
3	QPSK	8	0	21.94	21.77	21.97	23	1
3	QPSK	8	4	21.83	21.86	21.87		
3	QPSK	8	7	21.88	21.82	21.92		
3	QPSK	15	0	21.99	21.90	21.85		
3	16QAM	1	0	22.11	21.95	21.62	23	1
3	16QAM	1	8	22.18	21.50	21.23		
3	16QAM	1	14	22.26	21.60	21.72		
3	16QAM	8	0	20.95	20.83	20.95	22	2
3	16QAM	8	4	20.90	20.76	20.99		
3	16QAM	8	7	20.90	20.76	20.90		
3	16QAM	15	0	20.96	20.93	20.92		

Channel				20407	20525	20643	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				824.7	836.5	848.3		
1.4	QPSK	1	0	22.67	22.84	22.76	24	0
1.4	QPSK	1	3	22.64	22.83	22.94		
1.4	QPSK	1	5	22.48	22.67	22.86		
1.4	QPSK	3	0	22.82	22.88	22.83		
1.4	QPSK	3	1	22.94	23.00	22.90		
1.4	QPSK	3	3	22.93	22.91	22.85		
1.4	QPSK	6	0	21.89	21.88	21.90	23	1
1.4	16QAM	1	0	21.36	21.31	22.00	23	1
1.4	16QAM	1	3	21.42	21.54	21.62		
1.4	16QAM	1	5	21.33	21.73	21.24		
1.4	16QAM	3	0	21.63	21.67	21.81		
1.4	16QAM	3	1	22.14	21.80	21.85		
1.4	16QAM	3	3	22.13	21.82	22.19		
1.4	16QAM	6	0	20.74	20.85	20.69	22	2

<LTE Band 7>

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				20850	21100	21350		
Frequency (MHz)				2510	2535	2560		
20	QPSK	1	0	22.64	22.73	22.58	24	0
20	QPSK	1	49	23.00	23.19	23.24		
20	QPSK	1	99	22.74	22.69	22.81		
20	QPSK	50	0	21.91	22.12	22.03	23	1
20	QPSK	50	24	21.96	22.13	22.14		
20	QPSK	50	50	21.96	22.03	22.12		
20	QPSK	100	0	21.94	22.13	22.12		
20	16QAM	1	0	21.46	21.70	21.51	23	1
20	16QAM	1	49	22.14	21.67	22.27		
20	16QAM	1	99	22.08	21.47	21.73		
20	16QAM	50	0	20.88	21.21	21.09	22	2
20	16QAM	50	24	20.94	21.22	21.21		
20	16QAM	50	50	20.94	21.03	21.20		
20	16QAM	100	0	20.84	21.15	21.09		
Channel				20825	21100	21375	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2507.5	2535	2562.5		
15	QPSK	1	0	22.46	22.71	22.68	24	0
15	QPSK	1	37	22.97	23.01	22.95		
15	QPSK	1	74	22.62	22.65	22.98		
15	QPSK	36	0	21.61	21.97	22.06	23	1
15	QPSK	36	20	21.79	21.94	22.08		
15	QPSK	36	39	21.67	21.93	22.05		
15	QPSK	75	0	21.67	21.91	22.04		
15	16QAM	1	0	21.45	21.53	21.43	23	1
15	16QAM	1	37	21.89	21.61	22.39		
15	16QAM	1	74	21.92	21.41	22.38		
15	16QAM	36	0	20.52	20.93	20.95	22	2
15	16QAM	36	20	20.74	20.88	20.92		
15	16QAM	36	39	20.58	20.87	21.08		
15	16QAM	75	0	20.74	20.88	20.95		
Channel				20800	21100	21400	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2505	2535	2565		
10	QPSK	1	0	22.39	22.79	22.91	24	0
10	QPSK	1	25	22.72	22.87	23.00		
10	QPSK	1	49	22.57	22.80	23.01		
10	QPSK	25	0	21.69	21.93	22.05	23	1
10	QPSK	25	12	21.59	22.04	22.21		
10	QPSK	25	25	21.65	21.90	22.12		
10	QPSK	50	0	21.71	22.03	21.98		
10	16QAM	1	0	21.74	22.12	21.78	23	1
10	16QAM	1	25	21.65	22.25	21.66		
10	16QAM	1	49	21.66	21.43	21.64		
10	16QAM	25	0	20.59	20.88	21.02	22	2
10	16QAM	25	12	20.69	20.97	21.06		
10	16QAM	25	25	20.68	20.87	21.16		
10	16QAM	50	0	20.67	20.82	21.02		

Channel				20775	21100	21425	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2502.5	2535	2567.5		
5	QPSK	1	0	22.43	22.85	22.70	24	0
5	QPSK	1	12	22.88	22.88	22.94		
5	QPSK	1	24	22.58	22.90	22.68		
5	QPSK	12	0	21.65	21.99	22.02	23	1
5	QPSK	12	7	21.71	22.01	22.11		
5	QPSK	12	13	21.62	21.95	21.96		
5	QPSK	25	0	21.67	21.93	22.01		
5	16QAM	1	0	21.56	21.43	21.38	23	1
5	16QAM	1	12	21.70	21.88	22.24		
5	16QAM	1	24	21.47	21.50	21.51		
5	16QAM	12	0	20.54	20.77	20.91	22	2
5	16QAM	12	7	20.52	20.91	21.00		
5	16QAM	12	13	20.37	20.72	20.95		
5	16QAM	25	0	20.60	20.82	20.88		

<Hotspot / Near-Body Power Mode>

<LTE Band 7>

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				20850	21100	21350		
Frequency (MHz)				2510	2535	2560		
20	QPSK	1	0	16.69	16.53	16.16	17	0
20	QPSK	1	49	16.99	16.87	17.00		
20	QPSK	1	99	16.98	16.29	16.42		
20	QPSK	50	0	15.95	15.69	15.96	16	1
20	QPSK	50	24	15.85	15.63	15.54		
20	QPSK	50	50	15.75	15.50	15.52		
20	QPSK	100	0	15.52	15.65	15.84		
20	16QAM	1	0	15.68	15.50	15.17	16	1
20	16QAM	1	49	15.70	15.52	15.41		
20	16QAM	1	99	15.48	15.24	15.31		
20	16QAM	50	0	14.92	14.75	14.68	15	2
20	16QAM	50	24	14.81	14.69	14.67		
20	16QAM	50	50	14.70	14.65	14.66		
20	16QAM	100	0	14.78	14.68	14.70		
Channel				20825	21100	21375	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2507.5	2535	2562.5		
15	QPSK	1	0	15.98	16.17	15.86	17	0
15	QPSK	1	37	16.22	16.34	16.46		
15	QPSK	1	74	16.10	16.17	16.23		
15	QPSK	36	0	15.40	15.52	15.46	16	1
15	QPSK	36	20	15.42	15.54	15.50		
15	QPSK	36	39	15.41	15.47	15.51		
15	QPSK	75	0	15.36	15.54	15.43		
15	16QAM	1	0	14.84	15.29	14.98	16	1
15	16QAM	1	37	15.03	15.19	15.78		
15	16QAM	1	74	14.82	14.92	15.42		
15	16QAM	36	0	14.24	14.54	14.28	15	2
15	16QAM	36	20	14.27	14.59	14.45		
15	16QAM	36	39	14.25	14.42	14.45		
15	16QAM	75	0	14.39	14.40	14.38		
Channel				20800	21100	21400	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2505	2535	2565		
10	QPSK	1	0	16.03	16.13	15.95	17	0
10	QPSK	1	25	16.12	16.55	16.47		
10	QPSK	1	49	16.01	16.13	16.02		
10	QPSK	25	0	15.49	15.53	15.50	16	1
10	QPSK	25	12	15.43	15.60	15.48		
10	QPSK	25	25	15.41	15.53	15.50		
10	QPSK	50	0	15.40	15.58	15.52		
10	16QAM	1	0	14.88	15.01	14.94	16	1
10	16QAM	1	25	15.26	15.11	15.73		
10	16QAM	1	49	15.04	15.01	15.61		
10	16QAM	25	0	14.39	14.59	14.47	15	2
10	16QAM	25	12	14.39	14.57	14.45		
10	16QAM	25	25	14.46	14.48	14.45		
10	16QAM	50	0	14.45	14.55	14.42		

Channel				20775	21100	21425	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2502.5	2535	2567.5		
5	QPSK	1	0	15.97	16.13	15.98	17	0
5	QPSK	1	12	16.25	16.39	16.23		
5	QPSK	1	24	16.16	16.22	16.12		
5	QPSK	12	0	15.34	15.47	15.37	16	1
5	QPSK	12	7	15.48	15.54	15.45		
5	QPSK	12	13	15.34	15.45	15.40		
5	QPSK	25	0	15.36	15.49	15.44		
5	16QAM	1	0	15.36	14.81	15.36	16	1
5	16QAM	1	12	15.46	15.33	15.52		
5	16QAM	1	24	15.28	15.12	14.60		
5	16QAM	12	0	14.43	14.33	14.18	15	2
5	16QAM	12	7	14.46	14.53	14.49		
5	16QAM	12	13	14.40	14.52	14.37		
5	16QAM	25	0	14.40	14.55	14.29		

<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.

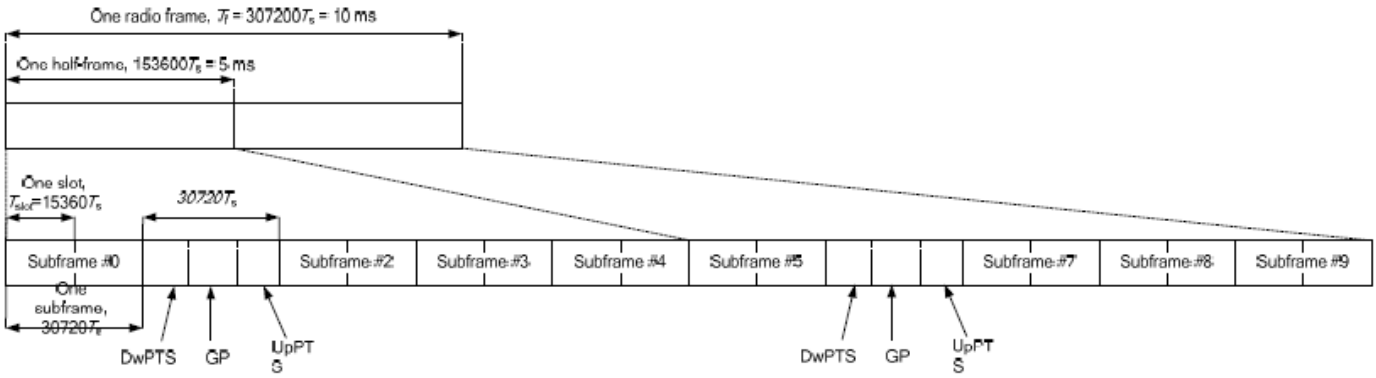


Figure 4.2-1: Frame structure type 2 (for 5 ms switch-point periodicity).

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.

vi. The device supports Power Class 2 uplink-downlink configurations 0 and 6, and Power Class 3 uplink-downlink configurations 1 to 5 operations for LTE Band 41.

vii. The highest available duty cycle for Power Class 2 operation is 43.3% using UL-DL configuration 1, for Power Class 3 operation is 63.3% using UL-DL configuration 0. Per FCC Guidance, all SAR tests were performed using Power Class 3. SAR with Power Class 2 at the available duty factor was additionally performed for the Power Class 3 configuration with the highest SAR among all exposure condition. Please see Section 14.6 for linearity results.

<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	22.67	22.81	22.62	24	0
20	QPSK	1	49	23.04	23.08	23.13		
20	QPSK	1	99	22.69	22.68	22.89		
20	QPSK	50	0	22.00	22.01	21.99	23	1
20	QPSK	50	24	22.07	22.09	22.13		
20	QPSK	50	50	21.96	22.01	21.92		
20	QPSK	100	0	22.02	22.00	22.10		
20	16QAM	1	0	21.71	21.46	21.47	23	1
20	16QAM	1	49	21.67	22.05	21.84		
20	16QAM	1	99	21.46	21.49	21.75		
20	16QAM	50	0	20.95	21.06	21.02	22	2
20	16QAM	50	24	21.10	20.98	20.98		
20	16QAM	50	50	20.98	20.98	21.05		
20	16QAM	100	0	20.99	21.06	21.05		
Channel				37825	38000	38175	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2577.5	2595	2612.5		
15	QPSK	1	0	22.90	22.54	22.65	24	0
15	QPSK	1	37	22.95	22.80	22.86		
15	QPSK	1	74	22.80	22.74	22.86		
15	QPSK	36	0	22.04	21.85	21.94	23	1
15	QPSK	36	20	21.96	22.00	22.09		
15	QPSK	36	39	21.95	21.88	22.04		
15	QPSK	75	0	21.98	21.82	22.07		
15	16QAM	1	0	21.59	21.41	21.35	23	1
15	16QAM	1	37	21.96	21.64	21.66		
15	16QAM	1	74	21.51	21.46	21.47		
15	16QAM	36	0	20.97	20.81	20.78	22	2
15	16QAM	36	20	20.83	20.78	20.83		
15	16QAM	36	39	20.85	20.75	20.92		
15	16QAM	75	0	20.86	21.00	20.81		
Channel				37800	38000	38200	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2575	2595	2615		
10	QPSK	1	0	22.84	22.54	22.65	24	0
10	QPSK	1	25	22.94	22.73	22.77		
10	QPSK	1	49	22.77	22.69	22.77		
10	QPSK	25	0	22.00	21.79	21.84	23	1
10	QPSK	25	12	21.88	21.99	22.06		
10	QPSK	25	25	21.92	21.80	22.00		
10	QPSK	50	0	21.97	21.79	21.97		
10	16QAM	1	0	21.51	21.33	21.34	23	1
10	16QAM	1	25	21.92	21.60	21.62		
10	16QAM	1	49	21.43	21.41	21.38		
10	16QAM	25	0	20.92	20.76	20.73	22	2
10	16QAM	25	12	20.77	20.71	20.78		
10	16QAM	25	25	20.78	20.67	20.86		
10	16QAM	50	0	20.79	20.93	20.73		

Channel				37775	38000	38225	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2572.5	2595	2617.5		
5	QPSK	1	0	22.80	22.52	22.57	24	0
5	QPSK	1	12	22.85	22.65	22.73		
5	QPSK	1	24	22.69	22.63	22.73		
5	QPSK	12	0	21.96	21.77	21.78	23	1
5	QPSK	12	7	21.79	21.91	21.98		
5	QPSK	12	13	21.82	21.79	21.95		
5	QPSK	25	0	21.97	21.75	21.88		
5	16QAM	1	0	21.47	21.23	21.25	23	1
5	16QAM	1	12	21.90	21.50	21.52		
5	16QAM	1	24	21.36	21.37	21.36		
5	16QAM	12	0	20.91	20.67	20.70	22	2
5	16QAM	12	7	20.69	20.67	20.76		
5	16QAM	12	13	20.77	20.62	20.80		
5	16QAM	25	0	20.71	20.91	20.68		

<LTE Band 41>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Low Ch. / Freq.	Power Middle High Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				40140	40400	40670	41140		
Frequency (MHz)				2545	2571	2598	2645		
20	QPSK	1	0	22.52	22.68	22.57	22.68	24	0
20	QPSK	1	49	23.16	23.25	23.01	23.00		
20	QPSK	1	99	22.96	22.67	22.65	22.53		
20	QPSK	50	0	22.04	22.05	22.01	21.87	23	1
20	QPSK	50	24	22.00	21.99	21.92	21.79		
20	QPSK	50	50	22.04	21.96	21.92	21.68		
20	QPSK	100	0	22.03	22.04	22.01	21.84		
20	16QAM	1	0	21.27	21.73	21.42	21.67	23	1
20	16QAM	1	49	21.80	21.80	21.74	21.65		
20	16QAM	1	99	21.80	21.40	21.38	21.18		
20	16QAM	50	0	20.97	20.96	21.10	20.81	22	2
20	16QAM	50	24	20.98	20.93	20.96	20.74		
20	16QAM	50	50	20.97	20.82	20.96	20.64		
20	16QAM	100	0	21.02	20.99	20.98	20.75		
Channel				40115	40395	40685	41165	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2542.5	2570.5	2599.5	2647.5		
15	QPSK	1	0	22.50	22.67	22.52	22.68	24	0
15	QPSK	1	37	23.14	23.18	22.97	22.90		
15	QPSK	1	74	22.88	22.65	22.58	22.50		
15	QPSK	36	0	21.98	21.96	21.85	21.81	23	1
15	QPSK	36	20	21.98	21.94	21.89	21.71		
15	QPSK	36	39	22.03	21.90	21.96	21.63		
15	QPSK	75	0	21.94	22.04	21.95	21.82		
15	16QAM	1	0	21.22	21.67	21.32	21.57	23	1
15	16QAM	1	37	21.70	21.78	21.64	21.55		
15	16QAM	1	74	21.70	21.39	21.33	21.13		
15	16QAM	36	0	20.87	20.86	21.06	20.73	22	2
15	16QAM	36	20	20.95	20.87	20.95	20.72		
15	16QAM	36	39	20.96	20.80	20.88	20.59		
15	16QAM	75	0	20.96	20.95	20.95	20.67		
Channel				40090	40390	40690	41190	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2540	2570	2600	2650		
10	QPSK	1	0	22.45	22.57	22.46	22.66	24	0
10	QPSK	1	25	23.05	23.12	22.88	22.80		
10	QPSK	1	49	22.78	22.60	22.51	22.48		
10	QPSK	25	0	21.97	21.95	21.80	21.76	23	1
10	QPSK	25	12	21.90	21.89	21.86	21.65		
10	QPSK	25	25	21.96	21.88	21.88	21.53		
10	QPSK	50	0	21.85	21.97	21.92	21.73		
10	16QAM	1	0	21.21	21.58	21.25	21.49	23	1
10	16QAM	1	25	21.68	21.74	21.59	21.45		
10	16QAM	1	49	21.67	21.29	21.29	21.09		
10	16QAM	25	0	20.85	20.78	20.97	20.70	22	2
10	16QAM	25	12	20.89	20.78	20.94	20.67		
10	16QAM	25	25	20.92	20.79	20.86	20.50		
10	16QAM	50	0	20.95	20.92	20.94	20.57		

Channel				40065	40385	40705	41215	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2537.5	2569.5	2601.5	2652.5		
5	QPSK	1	0	22.36	22.49	22.42	22.57	24	0
5	QPSK	1	12	23.02	23.02	22.78	22.79		
5	QPSK	1	24	22.77	22.60	22.41	22.45		
5	QPSK	12	0	21.94	21.85	21.72	21.71	23	1
5	QPSK	12	7	21.85	21.81	21.81	21.56		
5	QPSK	12	13	21.94	21.82	21.83	21.45		
5	QPSK	25	0	21.77	21.92	21.83	21.66		
5	16QAM	1	0	21.18	21.56	21.24	21.49	23	1
5	16QAM	1	12	21.61	21.74	21.49	21.35		
5	16QAM	1	24	21.62	21.22	21.21	21.08		
5	16QAM	12	0	20.83	20.69	20.93	20.65	22	2
5	16QAM	12	7	20.82	20.78	20.89	20.66		
5	16QAM	12	13	20.82	20.75	20.77	20.44		
5	16QAM	25	0	20.87	20.86	20.89	20.54		

<Near-Body / Hotspot 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	19.22	19.32	19.31	19.5	0
20	QPSK	1	49	19.47	19.48	19.49		
20	QPSK	1	99	19.19	19.21	19.14		
20	QPSK	50	0	18.26	18.36	18.37	18.5	1
20	QPSK	50	24	18.21	18.30	18.27		
20	QPSK	50	50	18.14	18.26	18.20		
20	QPSK	100	0	18.22	18.23	18.31		
20	16QAM	1	0	17.94	18.13	18.09	18.5	1
20	16QAM	1	49	18.23	18.37	18.29		
20	16QAM	1	99	18.01	17.95	17.91		
20	16QAM	50	0	17.28	17.34	17.36	17.5	2
20	16QAM	50	24	17.30	17.37	17.25		
20	16QAM	50	50	17.25	17.26	17.30		
20	16QAM	100	0	17.26	17.30	17.22		
Channel				37825	38000	38175	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2577.5	2595	2612.5		
15	QPSK	1	0	18.72	18.78	18.61	19.5	0
15	QPSK	1	37	19.01	19.12	18.79		
15	QPSK	1	74	18.89	18.75	18.66		
15	QPSK	36	0	17.85	17.88	17.84	18.5	1
15	QPSK	36	20	17.88	17.89	17.87		
15	QPSK	36	39	17.89	17.85	17.88		
15	QPSK	75	0	17.89	17.88	17.86		
15	16QAM	1	0	17.38	17.42	17.37	18.5	1
15	16QAM	1	37	17.52	17.66	17.74		
15	16QAM	1	74	17.41	17.38	17.37		
15	16QAM	36	0	16.89	16.90	16.80	17.5	2
15	16QAM	36	20	16.80	16.73	16.79		
15	16QAM	36	39	16.75	16.80	16.81		
15	16QAM	75	0	16.76	16.95	16.89		
Channel				37800	38000	38200	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2575	2595	2615		
10	QPSK	1	0	18.72	18.61	18.66	19.5	0
10	QPSK	1	25	18.81	18.79	18.72		
10	QPSK	1	49	18.63	18.65	18.64		
10	QPSK	25	0	17.90	17.93	17.92	18.5	1
10	QPSK	25	12	17.87	17.93	17.90		
10	QPSK	25	25	17.81	17.86	17.80		
10	QPSK	50	0	17.87	17.95	17.91		
10	16QAM	1	0	17.49	17.55	17.43	18.5	1
10	16QAM	1	25	17.67	17.72	17.68		
10	16QAM	1	49	17.22	17.49	17.19		
10	16QAM	25	0	16.85	17.12	16.85	17.5	2
10	16QAM	25	12	16.99	17.13	17.17		
10	16QAM	25	25	17.09	16.95	17.09		
10	16QAM	50	0	16.96	16.98	16.87		

Channel				37775	38000	38225	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2572.5	2595	2617.5		
5	QPSK	1	0	18.60	18.54	18.58	19.5	0
5	QPSK	1	12	18.80	18.68	18.67		
5	QPSK	1	24	18.55	18.57	18.53		
5	QPSK	12	0	17.71	17.88	17.85	18.5	1
5	QPSK	12	7	17.84	17.86	17.83		
5	QPSK	12	13	17.78	17.78	17.73		
5	QPSK	25	0	17.79	17.80	17.77		
5	16QAM	1	0	17.27	17.33	17.38	18.5	1
5	16QAM	1	12	17.45	17.49	17.57		
5	16QAM	1	24	17.31	17.41	17.36		
5	16QAM	12	0	16.78	16.83	16.73	17.5	2
5	16QAM	12	7	16.72	16.92	16.90		
5	16QAM	12	13	16.65	16.79	16.81		
5	16QAM	25	0	16.97	16.77	16.84		

<LTE Band 41>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Low Ch. / Freq.	Power Middle High Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				40140	40400	40670	41140		
Frequency (MHz)				2545	2571	2598	2645		
20	QPSK	1	0	18.65	18.65	18.85	18.55	19.5	0
20	QPSK	1	49	18.80	19.05	18.95	18.71		
20	QPSK	1	99	18.53	18.78	18.82	18.37		
20	QPSK	50	0	17.79	18.13	17.94	17.75	18.5	1
20	QPSK	50	24	17.72	17.90	18.07	17.71		
20	QPSK	50	50	17.69	17.77	18.04	17.65		
20	QPSK	100	0	17.73	18.04	17.89	17.80		
20	16QAM	1	0	17.21	17.44	17.57	17.46	18.5	1
20	16QAM	1	49	17.53	17.75	17.92	17.61		
20	16QAM	1	99	17.29	17.31	17.43	17.16		
20	16QAM	50	0	16.79	17.02	17.11	16.73	17.5	2
20	16QAM	50	24	16.84	17.04	17.16	16.68		
20	16QAM	50	50	16.65	16.94	17.05	16.59		
20	16QAM	100	0	16.74	16.88	17.08	16.73		
Channel				40115	40395	40685	41165	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2542.5	2570.5	2599.5	2647.5		
15	QPSK	1	0	18.41	18.34	18.32	18.46	19.5	0
15	QPSK	1	37	18.61	18.66	18.34	18.49		
15	QPSK	1	74	18.46	18.32	18.40	18.53		
15	QPSK	36	0	17.42	17.40	17.36	17.57	18.5	1
15	QPSK	36	20	17.46	17.49	17.38	17.55		
15	QPSK	36	39	17.50	17.29	17.36	17.47		
15	QPSK	75	0	17.39	17.41	17.32	17.57		
15	16QAM	1	0	16.86	17.03	16.89	17.09	18.5	1
15	16QAM	1	37	17.08	17.17	17.01	17.22		
15	16QAM	1	74	16.98	16.87	16.96	17.02		
15	16QAM	36	0	16.44	16.40	16.28	16.47	17.5	2
15	16QAM	36	20	16.49	16.54	16.40	16.62		
15	16QAM	36	39	16.55	16.46	16.39	16.54		
15	16QAM	75	0	16.57	16.40	16.38	16.47		
Channel				40090	40390	40690	41190	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2540	2570	2600	2650		
10	QPSK	1	0	18.13	18.16	18.09	18.23	19.5	0
10	QPSK	1	25	18.41	18.40	18.29	18.31		
10	QPSK	1	49	18.36	18.34	18.27	18.31		
10	QPSK	25	0	17.42	17.40	17.33	17.55	18.5	1
10	QPSK	25	12	17.44	17.42	17.39	17.49		
10	QPSK	25	25	17.50	17.34	17.33	17.47		
10	QPSK	50	0	17.44	17.43	17.33	17.58		
10	16QAM	1	0	16.97	16.94	16.95	17.12	18.5	1
10	16QAM	1	25	17.33	17.17	17.04	17.38		
10	16QAM	1	49	17.10	16.96	16.90	17.08		
10	16QAM	25	0	16.62	16.47	16.31	16.74	17.5	2
10	16QAM	25	12	16.62	16.40	16.57	16.71		
10	16QAM	25	25	16.62	16.55	16.52	16.48		
10	16QAM	50	0	16.43	16.62	16.41	16.60		

Channel				40065	40385	40705	41215	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2537.5	2569.5	2601.5	2652.5		
5	QPSK	1	0	18.17	18.18	18.09	18.30	19.5	0
5	QPSK	1	12	18.33	18.39	18.42	18.40		
5	QPSK	1	24	18.15	18.20	18.21	18.33		
5	QPSK	12	0	17.39	17.31	17.33	17.49	18.5	1
5	QPSK	12	7	17.34	17.37	17.28	17.44		
5	QPSK	12	13	17.28	17.33	17.27	17.43		
5	QPSK	25	0	17.28	17.31	17.20	17.48		
5	16QAM	1	0	16.88	16.79	16.86	16.96	18.5	1
5	16QAM	1	12	17.08	16.93	17.02	17.11		
5	16QAM	1	24	16.85	16.85	16.91	16.88		
5	16QAM	12	0	16.49	16.30	16.81	16.53	17.5	2
5	16QAM	12	7	16.53	16.50	16.94	16.61		
5	16QAM	12	13	16.45	16.50	16.96	16.42		
5	16QAM	25	0	16.58	16.59	16.93	16.68		

<WLAN Conducted Power>

General Note:

1. Per KDB 248227 D01v02r02, SAR test reduction is determined according to 802.11 transmission mode configurations and certain exposure conditions with multiple test positions. In the 2.4 GHz band, separate SAR procedures are applied to DSSS and OFDM configurations to simplify DSSS test requirements. For OFDM, in both 2.4 and 5 GHz bands, an initial test configuration must be determined for each standalone and aggregated frequency band, according to the transmission mode configuration with the highest maximum output power specified for production units to perform SAR measurements. If the same highest maximum output power applies to different combinations of channel bandwidths, modulations and data rates, additional procedures are applied to determine which test configurations require SAR measurement. When applicable, an initial test position may be applied to reduce the number of SAR measurements required for next to the ear, UMPC mini-tablet or hotspot mode configurations with multiple test positions.
2. For 2.4 GHz 802.11b DSSS, either the initial test position procedure for multiple exposure test positions or the DSSS procedure for fixed exposure position is applied; these are mutually exclusive. For 2.4 GHz and 5 GHz OFDM configurations, the initial test configuration is applied to measure SAR using either the initial test position procedure for multiple exposure test position configurations or the initial test configuration procedures for fixed exposure test conditions. Based on the reported SAR of the measured configurations and maximum output power of the transmission mode configurations that are not included in the initial test configuration, the subsequent test configuration and initial test position procedures are applied to determine if SAR measurements are required for the remaining OFDM transmission configurations. In general, the number of test channels that require SAR measurement is minimized based on maximum output power measured for the test sample(s).
3. For OFDM transmission configurations in the 2.4 GHz and 5 GHz bands, When the same maximum power is specified for multiple transmission modes in a frequency band, the largest channel bandwidth, lowest order modulation, lowest data rate and lowest order 802.11a/g/n/ac mode is used for SAR measurement, on the highest measured output power channel for each frequency band.
4. DSSS and OFDM configurations are considered separately according to the required SAR procedures. SAR is measured in the initial test position using the 802.11 transmission mode configuration required by the DSSS procedure or initial test configuration and subsequent test configuration(s) according to the OFDM procedures.18 The initial test position procedure is described in the following:
   a. When the reported SAR of the initial test position is ≤ 0.4 W/kg, further SAR measurement is not required for the other test positions in that exposure configuration and 802.11 transmission mode combinations within the frequency band or aggregated band.
   b. When the reported SAR of the test position is > 0.4 W/kg, SAR is repeated for the 802.11 transmission mode configuration tested in the initial test position to measure the subsequent next closet/smallest test separation distance and maximum coupling test position on the highest maximum output power channel, until the report SAR is ≤ 0.8 W/kg or all required test position are tested.
   c. For all positions/configurations, when the reported SAR is > 0.8 W/kg, SAR is measured for these test positions/configurations on the subsequent next highest measured output power channel(s) until the reported SAR is ≤ 1.2 W/kg or all required channels are tested.

<Default Power Mode>

<2.4GHz WLAN>

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
2.4GHz WLAN	802.11b 1Mbps	1	2412	16.47	16.50	97.59
		6	2437	18.66	19.00	
		11	2462	18.26	19.00	
	802.11g 6Mbps	1	2412	11.20	11.50	87.50
		6	2437	18.46	19.00	
		11	2462	12.95	13.00	
	802.11n-HT20 MCS0	1	2412	9.44	10.00	86.76
		6	2437	17.67	18.00	
		11	2462	12.54	13.00	

<At-Head Power Mode>

<2.4GHz WLAN>

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
2.4GHz WLAN	802.11b 1Mbps	1	2412	15.47	15.50	97.59
		6	2437	17.66	18.00	
		11	2462	17.07	18.00	
	802.11g 6Mbps	1	2412	10.40	10.50	87.50
		6	2437	17.48	18.00	
		11	2462	11.90	12.00	
	802.11n-HT20 MCS0	1	2412	8.54	9.00	86.76
		6	2437	16.78	17.00	
		11	2462	11.55	12.00	

<2.4GHz Bluetooth>

Mode	Channel	Frequency (MHz)	Average power (dBm)		
			1Mbps	2Mbps	3Mbps
BR / EDR	CH 00	2402	11.03	9.72	9.77
	CH 39	2441	11.42	10.19	10.13
	CH 78	2480	10.05	8.76	8.80
Tune-up Limit			12.00	10.50	10.50

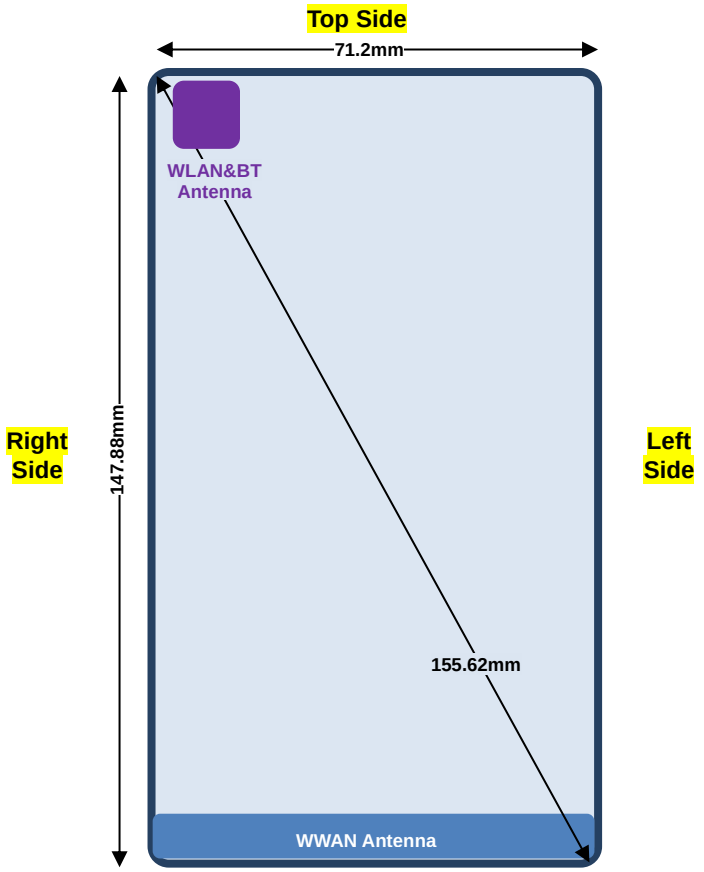
Mode	Channel	Frequency (MHz)	Average power (dBm)
			GFSK
LE	CH 00	2402	1.87
	CH 19	2440	2.40
	CH 39	2480	0.92
Tune-up Limit			3.00

General Note:

1. For 2.4GHz Bluetooth SAR testing was selected 1Mbps due to its highest average power and duty cycle is 76.97% considered in SAR testing, and the duty cycle would be scaled to theoretical 83.3% in reported SAR calculation.

12. Antenna Location

<Mobile Phone>



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
BT&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
BT&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 5 mm. SAR must be measured for all sides and surfaces.

13. 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/Bluetooth: Reported SAR(W/kg)= Measured SAR(W/kg)*Tune-up Scaling Factor
   d. For WLAN: Reported SAR(W/kg)= Measured SAR(W/kg)* Duty Cycle scaling factor * Tune-up scaling factor
   e. 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 Reported TDD LTE SAR = measured SAR (W/kg)* Tune-up Scaling Factor* scaling factor for extended cyclic prefix.
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. While the device operating in near-body condition by end user, the device will limit different maximum output powers on the GSM850 / GSM1900, WCDMA B2, LTE B7 / B38 / B41 transmitter and detail descriptions of the power reduction mechanism are included in the operational description.
6. While the device operating in mobile hotspot session, the device will reduced output powers on the GSM850 / GSM1900, WCDMA B2, LTE B7 / B38 / B41 transmitter and detail descriptions of the power reduction mechanism are included in the operational description.
7. While the device operating in At-Head session, the device will limit different maximum output powers on the WLAN transmitter and detail descriptions of the power reduction mechanism are included in the operational description.

GSM Note:

1. Per KDB 941225 D01v03r01, for SAR test reduction for GSM / GPRS / EDGE modes is determined by the source-based time-averaged output power including tune-up tolerance. The mode with highest specified time-averaged output power should be tested for SAR compliance in the applicable exposure conditions. For modes with the same specified maximum output power and tolerance, the higher number time-slot configuration should be tested. Therefore, the GPRS (4Tx slots) for GSM850/GSM1900 is considered as the primary mode.
2. Other configurations of GSM / GPRS / EDGE are considered as secondary modes. The 3G SAR test reduction procedure is applied, when the maximum output power and tune-up tolerance specified for production units in a secondary mode is ≤ ¼ dB higher than the primary mode, SAR measurement is not required for the secondary mode.

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. 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, and according to the following RF output power, the output power results of the secondary modes (HSUPA, HSDPA, DC-HSDPA) are less than ¼ dB higher than the primary modes; therefore, 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 B5 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 band 38 SAR test was covered by Band 41; according to 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.

WLAN/Bluetooth Note:

1. Per KDB 248227 D01v02r02, for 2.4GHz 802.11g/n SAR testing is not required when the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.
2. Per KDB 248227 D01v02r02, U-NII-1 SAR testing is not required when the U-NII-2A band highest reported SAR for a test configuration is ≤ 1.2 W/kg, SAR is not required for U-NII-1 band.
3. When the reported SAR of the test position is > 0.4 W/kg, SAR is repeated for the 802.11 transmission mode configuration tested in the initial test position to measure the subsequent next closet/smallest test separation distance and maximum coupling test position on the highest maximum output power channel, until the report SAR is ≤ 0.8 W/kg or all required test position are tested.
4. For all positions / configurations, when the reported SAR is > 0.8 W/kg, SAR is measured for these test positions / configurations on the subsequent next highest measured output power channel(s) until the reported SAR is ≤ 1.2 W/kg or all required channels are tested.
5. During SAR testing the WLAN transmission was verified using a spectrum analyzer.
6. Since the same RF amplifier and antenna is used for WiFi / Bluetooth transmitter and the Bluetooth output power is least 2 dB below the output power of WiFi, therefore, for Bluetooth SAR testing is selected worst position from each exposure condition to be tested.

13.1 Head SAR

<GSM 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)
01	GSM850	GPRS (4 Tx slots)	Right Cheek	0mm	189	836.4	28.96	30.50	1.426	-0.02	0.346	0.493
	GSM850	GPRS (4 Tx slots)	Right Tilted	0mm	189	836.4	28.96	30.50	1.426	0.02	0.185	0.264
	GSM850	GPRS (4 Tx slots)	Left Cheek	0mm	189	836.4	28.96	30.50	1.426	0.08	0.325	0.463
	GSM850	GPRS (4 Tx slots)	Left Tilted	0mm	189	836.4	28.96	30.50	1.426	-0.03	0.200	0.285
02	GSM1900	GPRS (4 Tx slots)	Right Cheek	0mm	512	1850.2	26.32	28.00	1.472	0.08	0.179	0.264
	GSM1900	GPRS (4 Tx slots)	Right Tilted	0mm	512	1850.2	26.32	28.00	1.472	0.05	0.052	0.077
	GSM1900	GPRS (4 Tx slots)	Left Cheek	0mm	512	1850.2	26.32	28.00	1.472	0.03	0.137	0.202
	GSM1900	GPRS (4 Tx slots)	Left Tilted	0mm	512	1850.2	26.32	28.00	1.472	-0.09	0.079	0.116

<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)
03	WCDMA II	RMC 12.2Kbps	Right Cheek	0mm	9400	1880	23.44	24.00	1.138	0.06	0.401	0.456
	WCDMA II	RMC 12.2Kbps	Right Tilted	0mm	9400	1880	23.44	24.00	1.138	-0.01	0.095	0.108
	WCDMA II	RMC 12.2Kbps	Left Cheek	0mm	9400	1880	23.44	24.00	1.138	0.07	0.327	0.372
	WCDMA II	RMC 12.2Kbps	Left Tilted	0mm	9400	1880	23.44	24.00	1.138	-0.04	0.185	0.210
04	WCDMA V	RMC 12.2Kbps	Right Cheek	0mm	4132	826.4	23.46	24.00	1.132	-0.12	0.204	0.231
	WCDMA V	RMC 12.2Kbps	Right Tilted	0mm	4132	826.4	23.46	24.00	1.132	0.02	0.112	0.127
	WCDMA V	RMC 12.2Kbps	Left Cheek	0mm	4132	826.4	23.46	24.00	1.132	-0.03	0.192	0.217
	WCDMA V	RMC 12.2Kbps	Left Tilted	0mm	4132	826.4	23.46	24.00	1.132	-0.02	0.121	0.137

<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)
05	LTE Band 5	10M	QPSK	1	25	Right Cheek	0mm	20525	836.5	23.27	24.00	1.183	-0.1	0.236	0.279
	LTE Band 5	10M	QPSK	25	0	Right Cheek	0mm	20525	836.5	22.26	23.00	1.186	-0.08	0.128	0.152
	LTE Band 5	10M	QPSK	1	25	Right Tilted	0mm	20525	836.5	23.27	24.00	1.183	-0.09	0.141	0.167
	LTE Band 5	10M	QPSK	25	0	Right Tilted	0mm	20525	836.5	22.26	23.00	1.186	0	0.078	0.092
	LTE Band 5	10M	QPSK	1	25	Left Cheek	0mm	20525	836.5	23.27	24.00	1.183	0.05	0.219	0.259
	LTE Band 5	10M	QPSK	25	0	Left Cheek	0mm	20525	836.5	22.26	23.00	1.186	0.18	0.121	0.143
	LTE Band 5	10M	QPSK	1	25	Left Tilted	0mm	20525	836.5	23.27	24.00	1.183	0	0.140	0.166
	LTE Band 5	10M	QPSK	25	0	Left Tilted	0mm	20525	836.5	22.26	23.00	1.186	-0.08	0.073	0.087
	LTE Band 7	20M	QPSK	1	49	Right Cheek	0mm	21350	2560	23.24	24.00	1.191	0.18	0.256	0.305
	LTE Band 7	20M	QPSK	50	24	Right Cheek	0mm	21350	2560	22.14	23.00	1.219	0.09	0.161	0.196
	LTE Band 7	20M	QPSK	1	49	Right Tilted	0mm	21350	2560	23.24	24.00	1.191	0.12	0.313	0.373
	LTE Band 7	20M	QPSK	50	24	Right Tilted	0mm	21350	2560	22.14	23.00	1.219	0	0.204	0.249
06	LTE Band 7	20M	QPSK	1	49	Left Cheek	0mm	21350	2560	23.24	24.00	1.191	0.12	0.638	0.760
	LTE Band 7	20M	QPSK	50	24	Left Cheek	0mm	21350	2560	22.14	23.00	1.219	0.09	0.408	0.497
	LTE Band 7	20M	QPSK	1	49	Left Tilted	0mm	21350	2560	23.24	24.00	1.191	0.08	0.270	0.322
	LTE Band 7	20M	QPSK	50	24	Left Tilted	0mm	21350	2560	22.14	23.00	1.219	0.01	0.183	0.223

<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)
	LTE Band 41	20M	QPSK	1	49	Right Cheek	0mm	40400	2571	23.25	24.00	1.189	62.9	1.006	0.14	0.167	0.200
	LTE Band 41	20M	QPSK	50	0	Right Cheek	0mm	40400	2571	22.05	23.00	1.245	62.9	1.006	0.15	0.112	0.140
	LTE Band 41	20M	QPSK	1	49	Right Tilted	0mm	40400	2571	23.25	24.00	1.189	62.9	1.006	0.09	0.205	0.245
	LTE Band 41	20M	QPSK	50	0	Right Tilted	0mm	40400	2571	22.05	23.00	1.245	62.9	1.006	0.07	0.134	0.168
07	LTE Band 41	20M	QPSK	1	49	Left Cheek	0mm	40400	2571	23.25	24.00	1.189	62.9	1.006	0.12	0.394	0.471
	LTE Band 41	20M	QPSK	50	0	Left Cheek	0mm	40400	2571	22.05	23.00	1.245	62.9	1.006	0.14	0.256	0.321
	LTE Band 41	20M	QPSK	1	49	Left Tilted	0mm	40400	2571	23.25	24.00	1.189	62.9	1.006	-0.19	0.169	0.202
	LTE Band 41	20M	QPSK	50	0	Left Tilted	0mm	40400	2571	22.05	23.00	1.245	62.9	1.006	0.12	0.111	0.139

<WLAN SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Power Reduction	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)
	WLAN2.4GHz	802.11b 1Mbps	Right Cheek	0mm	ON	6	2437	17.66	18.00	1.081	97.59	1.025	-0.1	0.296	0.328
	WLAN2.4GHz	802.11b 1Mbps	Right Tilted	0mm	ON	6	2437	17.66	18.00	1.081	97.59	1.025	0.06	0.190	0.211
	WLAN2.4GHz	802.11b 1Mbps	Left Cheek	0mm	ON	6	2437	17.66	18.00	1.081	97.59	1.025	-0.06	0.726	0.805
08	WLAN2.4GHz	802.11b 1Mbps	Left Cheek	0mm	ON	11	2462	17.07	18.00	1.239	97.59	1.025	0.17	0.870	1.105
	WLAN2.4GHz	802.11b 1Mbps	Left Tilted	0mm	ON	6	2437	17.66	18.00	1.081	97.59	1.025	0.05	0.427	0.473

<Bluetooth SAR>

Plot No.	Band	Mode	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)
09	Bluetooth	1Mbps	Left Cheek	0mm	39	2441	11.42	12.00	1.144	76.97	1.082	-0.15	0.199	0.246

13.2 Hotspot SAR

<GSM SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Power Reduction	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)
	GSM850	GPRS (4 Tx slots)	Front	5mm	ON	128	824.2	26.79	28.00	1.321	-0.05	0.288	0.381
	GSM850	GPRS (4 Tx slots)	Back	5mm	ON	128	824.2	26.79	28.00	1.321	0.11	0.656	0.867
	GSM850	GPRS (4 Tx slots)	Back	5mm	ON	189	836.4	26.60	28.00	1.380	0.07	0.751	1.037
10	GSM850	GPRS (4 Tx slots)	Back	5mm	ON	251	848.8	26.49	28.00	1.416	0.14	0.808	1.144
	GSM850	GPRS (4 Tx slots)	Left Side	5mm	ON	128	824.2	26.79	28.00	1.321	-0.04	0.353	0.466
	GSM850	GPRS (4 Tx slots)	Right Side	5mm	ON	128	824.2	26.79	28.00	1.321	-0.14	0.480	0.634
	GSM850	GPRS (4 Tx slots)	Bottom Side	5mm	ON	128	824.2	26.79	28.00	1.321	0.11	0.082	0.108
	GSM1900	GPRS (4 Tx slots)	Front	5mm	ON	810	1909.8	24.45	24.50	1.012	0.16	0.532	0.538
11	GSM1900	GPRS (4 Tx slots)	Back	5mm	ON	810	1909.8	24.45	24.50	1.012	-0.1	0.845	0.855
	GSM1900	GPRS (4 Tx slots)	Back	5mm	ON	512	1850.2	24.20	24.50	1.072	-0.07	0.533	0.571
	GSM1900	GPRS (4 Tx slots)	Back	5mm	ON	661	1880	24.32	24.50	1.042	-0.05	0.620	0.646
	GSM1900	GPRS (4 Tx slots)	Left Side	5mm	ON	810	1909.8	24.45	24.50	1.012	-0.06	0.248	0.251
	GSM1900	GPRS (4 Tx slots)	Right Side	5mm	ON	810	1909.8	24.45	24.50	1.012	-0.05	0.175	0.177
	GSM1900	GPRS (4 Tx slots)	Bottom Side	5mm	ON	810	1909.8	24.45	24.50	1.012	0.12	0.478	0.484

<WCDMA SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Power Reduction	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	5mm	ON	9400	1880	19.50	19.50	1.000	0.05	0.645	0.645
12	WCDMA II	RMC 12.2Kbps	Back	5mm	ON	9400	1880	19.50	19.50	1.000	-0.05	1.020	1.020
	WCDMA II	RMC 12.2Kbps	Back	5mm	ON	9262	1852.4	19.48	19.50	1.005	-0.09	0.941	0.945
	WCDMA II	RMC 12.2Kbps	Back	5mm	ON	9538	1907.6	19.47	19.50	1.007	-0.06	1.010	1.017
	WCDMA II	RMC 12.2Kbps	Left Side	5mm	ON	9400	1880	19.50	19.50	1.000	0.04	0.300	0.300
	WCDMA II	RMC 12.2Kbps	Right Side	5mm	ON	9400	1880	19.50	19.50	1.000	0.04	0.231	0.231
	WCDMA II	RMC 12.2Kbps	Bottom Side	5mm	ON	9400	1880	19.50	19.50	1.000	0.05	0.590	0.590
	WCDMA V	RMC 12.2Kbps	Front	5mm	OFF	4132	826.4	23.46	24.00	1.132	-0.01	0.174	0.197
	WCDMA V	RMC 12.2Kbps	Back	5mm	OFF	4132	826.4	23.46	24.00	1.132	-0.05	0.720	0.815
	WCDMA V	RMC 12.2Kbps	Back	5mm	OFF	4182	836.4	23.39	24.00	1.151	0.05	0.811	0.933
13	WCDMA V	RMC 12.2Kbps	Back	5mm	OFF	4233	846.6	23.45	24.00	1.135	0.01	0.950	1.078
	WCDMA V	RMC 12.2Kbps	Left Side	5mm	OFF	4132	826.4	23.46	24.00	1.132	-0.03	0.312	0.353
	WCDMA V	RMC 12.2Kbps	Right Side	5mm	OFF	4132	826.4	23.46	24.00	1.132	-0.01	0.442	0.501
	WCDMA V	RMC 12.2Kbps	Bottom Side	5mm	OFF	4132	826.4	23.46	24.00	1.132	0.19	0.087	0.099

<FDD LTE SAR>

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (mm)	Power Reduction	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 5	10M	QPSK	1	25	Front	5mm	OFF	20525	836.5	23.27	24.00	1.183	-0.16	0.188	0.222
	LTE Band 5	10M	QPSK	25	0	Front	5mm	OFF	20525	836.5	22.26	23.00	1.186	0.04	0.110	0.130
14	LTE Band 5	10M	QPSK	1	25	Back	5mm	OFF	20525	836.5	23.27	24.00	1.183	-0.09	0.881	1.042
	LTE Band 5	10M	QPSK	25	0	Back	5mm	OFF	20525	836.5	22.26	23.00	1.186	-0.1	0.468	0.555
	LTE Band 5	10M	QPSK	50	0	Back	5mm	OFF	20525	836.5	22.04	23.00	1.247	-0.05	0.479	0.597
	LTE Band 5	10M	QPSK	1	25	Left Side	5mm	OFF	20525	836.5	23.27	24.00	1.183	-0.01	0.334	0.395
	LTE Band 5	10M	QPSK	25	0	Left Side	5mm	OFF	20525	836.5	22.26	23.00	1.186	0.03	0.189	0.224
	LTE Band 5	10M	QPSK	1	25	Right Side	5mm	OFF	20525	836.5	23.27	24.00	1.183	0.07	0.477	0.564
	LTE Band 5	10M	QPSK	25	0	Right Side	5mm	OFF	20525	836.5	22.26	23.00	1.186	0.02	0.271	0.321
	LTE Band 5	10M	QPSK	1	25	Bottom Side	5mm	OFF	20525	836.5	23.27	24.00	1.183	0.04	0.102	0.121
	LTE Band 5	10M	QPSK	25	0	Bottom Side	5mm	OFF	20525	836.5	22.26	23.00	1.186	0.09	0.058	0.069
	LTE Band 7	20M	QPSK	1	49	Front	5mm	ON	21350	2560	17.00	17.00	1.000	0.16	0.435	0.435
	LTE Band 7	20M	QPSK	50	0	Front	5mm	ON	21350	2560	15.96	16.00	1.009	0.1	0.298	0.301
	LTE Band 7	20M	QPSK	1	49	Back	5mm	ON	21350	2560	17.00	17.00	1.000	-0.13	0.855	0.855
15	LTE Band 7	20M	QPSK	1	49	Back	5mm	ON	20850	2510	16.99	17.00	1.002	-0.19	1.150	1.153
	LTE Band 7	20M	QPSK	1	49	Back	5mm	ON	21100	2535	16.87	17.00	1.030	-0.11	1.030	1.061
	LTE Band 7	20M	QPSK	50	0	Back	5mm	ON	21350	2560	15.96	16.00	1.009	-0.14	0.704	0.711
	LTE Band 7	20M	QPSK	100	0	Back	5mm	ON	21350	2560	15.84	16.00	1.038	-0.13	0.689	0.715
	LTE Band 7	20M	QPSK	1	49	Left Side	5mm	ON	21350	2560	17.00	17.00	1.000	0.19	0.272	0.272
	LTE Band 7	20M	QPSK	50	0	Left Side	5mm	ON	21350	2560	15.96	16.00	1.009	0.16	0.211	0.213
	LTE Band 7	20M	QPSK	1	49	Right Side	5mm	ON	21350	2560	17.00	17.00	1.000	0.17	0.081	0.081
	LTE Band 7	20M	QPSK	50	0	Right Side	5mm	ON	21350	2560	15.96	16.00	1.009	0.16	0.064	0.065
	LTE Band 7	20M	QPSK	1	49	Bottom Side	5mm	ON	21350	2560	17.00	17.00	1.000	0.11	0.628	0.628
	LTE Band 7	20M	QPSK	50	0	Bottom Side	5mm	ON	21350	2560	15.96	16.00	1.009	0.19	0.502	0.507

<TDD LTE SAR>

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (mm)	Power Reduction	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	Front	5mm	ON	40400	2571	19.05	19.50	1.109	62.9	1.006	0.07	0.420	0.469
	LTE Band 41	20M	QPSK	50	0	Front	5mm	ON	40400	2571	18.13	18.50	1.089	62.9	1.006	0.16	0.309	0.338
	LTE Band 41	20M	QPSK	1	49	Back	5mm	ON	40400	2571	19.05	19.50	1.109	62.9	1.006	-0.17	0.835	0.932
16	LTE Band 41	20M	QPSK	1	49	Back	5mm	ON	40140	2545	18.80	19.50	1.175	62.9	1.006	-0.18	0.954	1.128
	LTE Band 41	20M	QPSK	1	49	Back	5mm	ON	40670	2598	18.95	19.50	1.135	62.9	1.006	-0.15	0.651	0.743
	LTE Band 41	20M	QPSK	1	49	Back	5mm	ON	41140	2645	18.71	19.50	1.199	62.9	1.006	-0.13	0.672	0.811
	LTE Band 41	20M	QPSK	50	0	Back	5mm	ON	40400	2571	18.13	18.50	1.089	62.9	1.006	-0.09	0.630	0.690
	LTE Band 41	20M	QPSK	1	49	Back	5mm	ON	40140	2545	17.79	18.50	1.178	62.9	1.006	-0.06	0.711	0.842
	LTE Band 41	20M	QPSK	1	49	Back	5mm	ON	40670	2598	17.94	18.50	1.138	62.9	1.006	-0.11	0.488	0.558
	LTE Band 41	20M	QPSK	1	49	Back	5mm	ON	41140	2645	17.75	18.50	1.189	62.9	1.006	-0.01	0.503	0.601
	LTE Band 41	20M	QPSK	50	0	Back	5mm	ON	40400	2571	18.04	18.50	1.112	62.9	1.006	-0.01	0.614	0.687
	LTE Band 41	20M	QPSK	50	0	Left Side	5mm	ON	40400	2571	19.05	19.50	1.109	62.9	1.006	0.11	0.278	0.310
	LTE Band 41	20M	QPSK	50	0	Left Side	5mm	ON	40400	2571	18.13	18.50	1.089	62.9	1.006	0.12	0.204	0.223
	LTE Band 41	20M	QPSK	1	49	Right Side	5mm	ON	40400	2571	19.05	19.50	1.109	62.9	1.006	0.03	0.089	0.099
	LTE Band 41	20M	QPSK	50	0	Right Side	5mm	ON	40400	2571	18.13	18.50	1.089	62.9	1.006	0.11	0.068	0.074
	LTE Band 41	20M	QPSK	1	49	Bottom Side	5mm	ON	40400	2571	19.05	19.50	1.109	62.9	1.006	0.11	0.530	0.591
	LTE Band 41	20M	QPSK	50	0	Bottom Side	5mm	ON	40400	2571	18.13	18.50	1.089	62.9	1.006	0.12	0.433	0.474

<WLAN SAR>

Plot No.	Band	Mode	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)
17	WLAN2.4GHz	802.11b 1Mbps	Front	5mm	6	2437	18.66	19.00	1.081	97.59	1.025	-0.11	0.475	0.527
	WLAN2.4GHz	802.11b 1Mbps	Back	5mm	6	2437	18.66	19.00	1.081	97.59	1.025	0.03	0.366	0.406
	WLAN2.4GHz	802.11b 1Mbps	Right Side	5mm	6	2437	18.66	19.00	1.081	97.59	1.025	0.14	0.420	0.466
	WLAN2.4GHz	802.11b 1Mbps	Top Side	5mm	6	2437	18.66	19.00	1.081	97.59	1.025	0.02	0.159	0.176

<Bluetooth SAR>

Plot No.	Band	Mode	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)
18	Bluetooth	1Mbps	Front	5mm	39	2441	11.42	12.00	1.144	76.97	1.082	0.18	0.098	0.121

13.3 Body Worn Accessory SAR

<GSM SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Power Reduction	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)
	GSM850	GPRS (4 Tx slots)	Front	5mm	ON	128	824.2	26.79	28.00	1.321	-0.05	0.288	0.381
	GSM850	GPRS (4 Tx slots)	Back	5mm	ON	128	824.2	26.79	28.00	1.321	0.11	0.656	0.867
	GSM850	GPRS (4 Tx slots)	Back	5mm	ON	189	836.4	26.60	28.00	1.380	0.07	0.751	1.037
19	GSM850	GPRS (4 Tx slots)	Back	5mm	ON	251	848.8	26.49	28.00	1.416	0.14	0.808	1.144
	GSM1900	GPRS (4 Tx slots)	Front	5mm	ON	810	1909.8	24.45	24.50	1.012	0.16	0.532	0.538
20	GSM1900	GPRS (4 Tx slots)	Back	5mm	ON	810	1909.8	24.45	24.50	1.012	-0.1	0.845	0.855
	GSM1900	GPRS (4 Tx slots)	Back	5mm	ON	512	1850.2	24.20	24.50	1.072	-0.07	0.533	0.571
	GSM1900	GPRS (4 Tx slots)	Back	5mm	ON	661	1880	24.32	24.50	1.042	-0.05	0.620	0.646

<WCDMA SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Power Reduction	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	5mm	ON	9400	1880	19.50	19.50	1.000	0.05	0.645	0.645
21	WCDMA II	RMC 12.2Kbps	Back	5mm	ON	9400	1880	19.50	19.50	1.000	-0.05	1.020	1.020
	WCDMA II	RMC 12.2Kbps	Back	5mm	ON	9262	1852.4	19.48	19.50	1.005	-0.09	0.941	0.945
	WCDMA II	RMC 12.2Kbps	Back	5mm	ON	9538	1907.6	19.47	19.50	1.007	-0.06	1.010	1.017
	WCDMA V	RMC 12.2Kbps	Front	5mm	OFF	4132	826.4	23.46	24.00	1.132	-0.01	0.174	0.197
	WCDMA V	RMC 12.2Kbps	Back	5mm	OFF	4132	826.4	23.46	24.00	1.132	-0.05	0.720	0.815
	WCDMA V	RMC 12.2Kbps	Back	5mm	OFF	4182	836.4	23.39	24.00	1.151	0.05	0.811	0.933
22	WCDMA V	RMC 12.2Kbps	Back	5mm	OFF	4233	846.6	23.45	24.00	1.135	0.01	0.950	1.078

<FDD LTE SAR>

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (mm)	Power Reduction	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 5	10M	QPSK	1	25	Front	5mm	OFF	20525	836.5	23.27	24.00	1.183	-0.16	0.188	0.222
	LTE Band 5	10M	QPSK	25	0	Front	5mm	OFF	20525	836.5	22.26	23.00	1.186	0.04	0.110	0.130
23	LTE Band 5	10M	QPSK	1	25	Back	5mm	OFF	20525	836.5	23.27	24.00	1.183	-0.09	0.881	1.042
	LTE Band 5	10M	QPSK	25	0	Back	5mm	OFF	20525	836.5	22.26	23.00	1.186	-0.1	0.468	0.555
	LTE Band 5	10M	QPSK	50	0	Back	5mm	OFF	20525	836.5	22.04	23.00	1.247	-0.05	0.479	0.597
	LTE Band 7	20M	QPSK	1	49	Front	5mm	ON	21350	2560	17.00	17.00	1.000	0.16	0.435	0.435
	LTE Band 7	20M	QPSK	50	0	Front	5mm	ON	21350	2560	15.96	16.00	1.009	0.1	0.298	0.301
	LTE Band 7	20M	QPSK	1	49	Back	5mm	ON	21350	2560	17.00	17.00	1.000	-0.13	0.855	0.855
24	LTE Band 7	20M	QPSK	1	49	Back	5mm	ON	20850	2510	16.99	17.00	1.002	-0.19	1.150	1.153
	LTE Band 7	20M	QPSK	1	49	Back	5mm	ON	21100	2535	16.87	17.00	1.030	-0.11	1.030	1.061
	LTE Band 7	20M	QPSK	50	0	Back	5mm	ON	21350	2560	15.96	16.00	1.009	-0.14	0.704	0.711
	LTE Band 7	20M	QPSK	100	0	Back	5mm	ON	21350	2560	15.84	16.00	1.038	-0.13	0.689	0.715

<TDD LTE SAR>

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (mm)	Power Reduction	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	Front	5mm	ON	40400	2571	19.05	19.50	1.109	62.9	1.006	0.07	0.420	0.469
	LTE Band 41	20M	QPSK	50	0	Front	5mm	ON	40400	2571	18.13	18.50	1.089	62.9	1.006	0.16	0.309	0.338
	LTE Band 41	20M	QPSK	1	49	Back	5mm	ON	40400	2571	19.05	19.50	1.109	62.9	1.006	-0.17	0.835	0.932
25	LTE Band 41	20M	QPSK	1	49	Back	5mm	ON	40140	2545	18.80	19.50	1.175	62.9	1.006	-0.18	0.954	1.128
	LTE Band 41	20M	QPSK	1	49	Back	5mm	ON	40670	2598	18.95	19.50	1.135	62.9	1.006	-0.15	0.651	0.743
	LTE Band 41	20M	QPSK	1	49	Back	5mm	ON	41140	2645	18.71	19.50	1.199	62.9	1.006	-0.13	0.672	0.811
	LTE Band 41	20M	QPSK	50	0	Back	5mm	ON	40400	2571	18.13	18.50	1.089	62.9	1.006	-0.09	0.630	0.690
	LTE Band 41	20M	QPSK	1	49	Back	5mm	ON	40140	2545	17.39	18.50	1.291	62.9	1.006	-0.06	0.711	0.924
	LTE Band 41	20M	QPSK	1	49	Back	5mm	ON	40670	2598	17.33	18.50	1.309	62.9	1.006	-0.11	0.488	0.643
	LTE Band 41	20M	QPSK	1	49	Back	5mm	ON	41140	2645	17.49	18.50	1.262	62.9	1.006	-0.01	0.503	0.639
	LTE Band 41	20M	QPSK	100	0	Back	5mm	ON	40400	2571	18.04	18.50	1.112	62.9	1.006	-0.01	0.614	0.687

<WLAN SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Power Reduction	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)
26	WLAN2.4GHz	802.11b 1Mbps	Front	5mm	OFF	6	2437	18.66	19.00	1.081	97.59	1.025	-0.11	0.475	0.527
	WLAN2.4GHz	802.11b 1Mbps	Back	5mm	OFF	6	2437	18.66	19.00	1.081	97.59	1.025	0.03	0.366	0.406

<Bluetooth SAR>

Plot No.	Band	Mode	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)
27	Bluetooth	1Mbps	Front	5mm	39	2441	11.42	12.00	1.144	76.97	1.082	0.18	0.098	0.121

13.4 Repeated SAR Measurement

No.	Band	Mode	Test Position	Gap (mm)	Power Reduction	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 II	RMC 12.2Kbps	Back	5mm	ON	9400	1880	19.50	19.50	1.000	-0.05	1.020		1.020
2nd	WCDMA II	RMC 12.2Kbps	Back	5mm	ON	9400	1880	19.50	19.50	1.000	0.18	0.989	1.03	0.989
1st	WCDMA V	RMC 12.2Kbps	Back	5mm	OFF	4233	846.6	23.45	24.00	1.135	0.01	0.950		1.078
2nd	WCDMA V	RMC 12.2Kbps	Back	5mm	OFF	4233	846.6	23.45	24.00	1.135	0.04	0.933	1.02	1.059
1st	LTE Band 7	20M_QPSK_1_49	Back	5mm	ON	20850	2510	16.99	17.00	1.002	-0.19	1.150		1.153
2nd	LTE Band 7	20M_QPSK_1_49	Back	5mm	ON	20850	2510	16.99	17.00	1.002	-0.03	1.040	1.11	1.042

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.

14. Simultaneous Transmission Analysis

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

General Note:

1. This device WLAN 2.4GHz supports Hotspot operation and Bluetooth support tethering applications.
2. WLAN and Bluetooth share the same antenna, and cannot transmit simultaneously.
3. The Scaled SAR summation is calculated based on the same configuration and test position.
4. 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 for 1g SAR, if SPLSR < 0.1 for 10g SAR, 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 14.4.

14.1 Head Exposure Conditions

WWAN Band		Exposure Position	1 WWAN 1g SAR (W/kg)	2 2.4GHz WLAN 1g SAR (W/kg)	3 Bluetooth 1g SAR (W/kg)	1+2 Summed 1g SAR (W/kg)	1+3 Summed 1g SAR (W/kg)	SPLSR	Case No
GSM	GSM850	Right Cheek	0.493	0.328	0.246	**0.821**	**0.739**		
		Right Tilted	0.264	0.211	0.246	**0.475**	**0.510**		
		Left Cheek	0.463	1.105	0.246	**1.568**	**0.709**		
		Left Tilted	0.285	0.473	0.246	**0.758**	**0.531**		
	GSM1900	Right Cheek	0.264	0.328	0.246	**0.592**	**0.510**		
		Right Tilted	0.077	0.211	0.246	**0.288**	**0.323**		
		Left Cheek	0.202	1.105	0.246	**1.307**	**0.448**		
		Left Tilted	0.116	0.473	0.246	**0.589**	**0.362**		
WCDMA	WCDMA II	Right Cheek	0.456	0.328	0.246	**0.784**	**0.702**		
		Right Tilted	0.108	0.211	0.246	**0.319**	**0.354**		
		Left Cheek	0.372	1.105	0.246	**1.477**	**0.618**		
		Left Tilted	0.210	0.473	0.246	**0.683**	**0.456**		
	WCDMA V	Right Cheek	0.231	0.328	0.246	**0.559**	**0.477**		
		Right Tilted	0.127	0.211	0.246	**0.338**	**0.373**		
		Left Cheek	0.217	1.105	0.246	**1.322**	**0.463**		
		Left Tilted	0.137	0.473	0.246	**0.610**	**0.383**		
LTE	LTE Band 5	Right Cheek	0.279	0.328	0.246	**0.607**	**0.525**		
		Right Tilted	0.167	0.211	0.246	**0.378**	**0.413**		
		Left Cheek	0.259	1.105	0.246	**1.364**	**0.505**		
		Left Tilted	0.166	0.473	0.246	**0.639**	**0.412**		
	LTE Band 7	Right Cheek	0.305	0.328	0.246	**0.633**	**0.551**		
		Right Tilted	0.373	0.211	0.246	**0.584**	**0.619**		
		Left Cheek	0.760	1.105	0.246	**1.865**	**1.006**	0.03	Case 1
		Left Tilted	0.322	0.473	0.246	**0.795**	**0.568**		
	LTE Band 41	Right Cheek	0.200	0.328	0.246	**0.528**	**0.446**		
		Right Tilted	0.245	0.211	0.246	**0.456**	**0.491**		
		Left Cheek	0.471	1.105	0.246	**1.576**	**0.717**		
		Left Tilted	0.202	0.473	0.246	**0.675**	**0.448**		

14.2 Hotspot Exposure Conditions

WWAN Band		Exposure Position	1 WWAN 1g SAR (W/kg)	2 2.4GHz WLAN 1g SAR (W/kg)	3 Bluetooth 1g SAR (W/kg)	1+2 Summed 1g SAR (W/kg)	1+3 Summed 1g SAR (W/kg)
GSM	GSM850	Front	0.381	0.527	0.121	**0.908**	**0.502**
		Back	1.144	0.406	0.121	**1.550**	**1.265**
		Left side	0.466			**0.466**	**0.466**
		Right side	0.634	0.466	0.121	**1.100**	**0.755**
		Top side		0.176	0.121	**0.176**	**0.121**
		Bottom side	0.108			**0.108**	**0.108**
	GSM1900	Front	0.538	0.527	0.121	**1.065**	**0.659**
		Back	0.855	0.406	0.121	**1.261**	**0.976**
		Left side	0.251			**0.251**	**0.251**
		Right side	0.177	0.466	0.121	**0.643**	**0.298**
		Top side		0.176	0.121	**0.176**	**0.121**
		Bottom side	0.484			**0.484**	**0.484**
WCDMA	WCDMA II	Front	0.645	0.527	0.121	**1.172**	**0.766**
		Back	1.020	0.406	0.121	**1.426**	**1.141**
		Left side	0.300			**0.300**	**0.300**
		Right side	0.231	0.466	0.121	**0.697**	**0.352**
		Top side		0.176	0.121	**0.176**	**0.121**
		Bottom side	0.590			**0.590**	**0.590**
	WCDMA V	Front	0.197	0.527	0.121	**0.724**	**0.318**
		Back	1.078	0.406	0.121	**1.484**	**1.199**
		Left side	0.353			**0.353**	**0.353**
		Right side	0.501	0.466	0.121	**0.967**	**0.622**
		Top side		0.176	0.121	**0.176**	**0.121**
		Bottom side	0.099			**0.099**	**0.099**
LTE	LTE Band 5	Front	0.222	0.527	0.121	**0.749**	**0.343**
		Back	1.042	0.406	0.121	**1.448**	**1.163**
		Left side	0.395			**0.395**	**0.395**
		Right side	0.564	0.466	0.121	**1.030**	**0.685**
		Top side		0.176	0.121	**0.176**	**0.121**
		Bottom side	0.121			**0.121**	**0.121**
	LTE Band 7	Front	0.435	0.527	0.121	**0.962**	**0.556**
		Back	1.153	0.406	0.121	**1.559**	**1.274**
		Left side	0.272			**0.272**	**0.272**
		Right side	0.081	0.466	0.121	**0.547**	**0.202**
		Top side		0.176	0.121	**0.176**	**0.121**
		Bottom side	0.628			**0.628**	**0.628**
	LTE Band 41	Front	0.469	0.527	0.121	**0.996**	**0.590**
		Back	1.128	0.406	0.121	**1.534**	**1.249**
		Left side	0.310			**0.310**	**0.310**
		Right side	0.099	0.466	0.121	**0.565**	**0.220**
		Top side		0.176	0.121	**0.176**	**0.121**
		Bottom side	0.591			**0.591**	**0.591**

14.3 Body-Worn Accessory Exposure Conditions

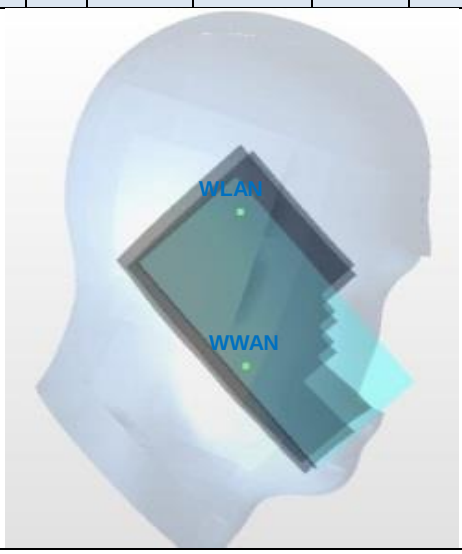
WWAN Band		Exposure Position	1 WWAN 1g SAR (W/kg)	2 2.4GHz WLAN 1g SAR (W/kg)	3 Bluetooth 1g SAR (W/kg)	1+2 Summed 1g SAR (W/kg)	1+3 Summed 1g SAR (W/kg)
GSM	GSM850	Front	0.381	0.527	0.121	**0.908**	**0.502**
		Back	1.144	0.406	0.121	**1.550**	**1.265**
	GSM1900	Front	0.538	0.527	0.121	**1.065**	**0.659**
		Back	0.855	0.406	0.121	**1.261**	**0.976**
WCDMA	WCDMA II	Front	0.645	0.527	0.121	**1.172**	**0.766**
		Back	1.020	0.406	0.121	**1.426**	**1.141**
	WCDMA V	Front	0.197	0.527	0.121	**0.724**	**0.318**
		Back	1.078	0.406	0.121	**1.484**	**1.199**
LTE	LTE Band 5	Front	0.222	0.527	0.121	**0.749**	**0.343**
		Back	1.042	0.406	0.121	**1.448**	**1.163**
	LTE Band 7	Front	0.435	0.527	0.121	**0.962**	**0.556**
		Back	1.153	0.406	0.121	**1.559**	**1.274**
	LTE Band 41	Front	0.469	0.527	0.121	**0.996**	**0.590**
		Back	1.128	0.406	0.121	**1.534**	**1.249**

14.4 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 (mm)	SAR peak location (mm) X	Y	Z	3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
	LTE Band 7	Left Cheek	0.76	0mm	51.76	-64.99	0.48	93.4	1.87	0.03	Not required
	WLAN2.4G		1.105	0mm	16.61	21.55	-0.87				



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15. Uncertainty Assessment

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

16. 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 D06 v02r01, "SAR Evaluation Procedures for Portable Devices with Wireless Router Capabilities", Oct 2015.

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

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