SAR TEST REPORT

No. I19Z60553-SEM01

For

Huawei Technologies Co.,Ltd

Tablet

Model Name: AGS2-L09

With

Hardware Version: A6t6e-2

Software Version: AGS2-L09 8.0.0.18(C432)

FCC ID: QISAGS2-L09A

Issued Date: 2019-5-27

TESTING
NVLAP LAB CODE 600118-0

Note:

The test results in this test report relate only to the devices specified in this report. This report shall not be reproduced except in full without the written approval of CTTL.

The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S.Government.

Test Laboratory:

CTTL, Telecommunication Technology Labs, CAICT

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REPORT HISTORY

Report Number	Revision	Issue Date	Description
I19Z60553-SEM01	Rev.0	2019-5-6	Initial creation of test report
I19Z60553-SEM01	Rev.1	2019-5-27	Add test of WiFi 2.4G 11g

TABLE OF CONTENT

1 Test Laboratory

1.1 Testing Location

Company Name:	CTTL(Shouxiang)
Address:	No. 51 Shouxiang Science Building, Xueyuan Road, Haidian District, Beijing, P. R. China100191

1.2 Testing Environment

Temperature:	18°C~25 °C,
Relative humidity:	30%~ 70%
Ground system resistance:	< 0.5 Ω
Ambient noise & Reflection:	< 0.012 W/kg

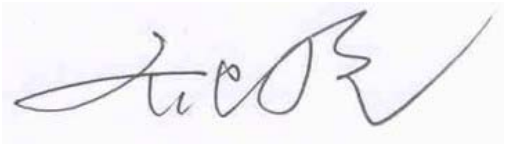
1.3 Project Data

Project Leader:	Qi Dianyuan
Test Engineer:	Lin Xiaojun
Testing Start Date:	April 14, 2019
Testing End Date:	May 25, 2019

1.4 Signature

Lin Xiaojun

(Prepared this test report)



Qi Dianyuan

(Reviewed this test report)

Lu Bingsong

Deputy Director of the laboratory

(Approved this test report)

2 Statement of Compliance

The maximum results of SAR found during testing for Huawei Technologies Co.,Ltd Tablet AGS2-L09 is as follows:

Table 2.1: Highest Reported SAR (1g)

Exposure Configuration	Technology Band	Highest Reported SAR 1g (W/Kg)	Equipment Class
Hotspot (Separation Distance 0mm)	GSM 850	0.41	PCE
	PCS 1900	1.03	
	UMTS FDD 2	0.76	
	UMTS FDD 5	0.43	
	LTE Band 5	0.28	
	LTE Band 7	1.00	
	WiFi 2.4G	0.85	DTS

The SAR values found for the Mobile Phone are below the maximum recommended levels of 1.6 W/Kg as averaged over any 1g tissue according to the ANSI C95.1-1992.

For body worn operation, this device has been tested and meets FCC RF exposure guidelines when used with any accessory that contains no metal and which provides a minimum separation distance of 10 mm between this device and the body of the user. Use of other accessories may not ensure compliance with FCC RF exposure guidelines.

The EUT battery must be fully charged and checked periodically during the test to ascertain uniform power output.

The measurement together with the test system set-up is described in annex C of this test report. A detailed description of the equipment under test can be found in chapter 4 of this test report.

The highest reported SAR value is obtained at the case of **(Table 2.1),** and the values are**:** 1.03 **W/kg (1g).**

Table 2.2: The sum of reported SAR values for main antenna and WiFi

	Position	Main antenna	WiFi	Sum
Highest reported SAR value for Body 2.4G	Rear 0mm PCS1900	0.58	0.85	**1.43**
Highest reported SAR value for Body 5G	Right 0mm PCS1900	1.03	0.32	**1.35**

Table 2.3: The sum of reported SAR values for main antenna and BT

	Position	Main antenna	BT	Sum
Maximum reported SAR value for Body	Right 0mm PCS1900	1.03	0.33	**1.36**

[1] - Estimated SAR for Bluetooth (see the table 13.3)

According to the above tables, the highest sum of reported SAR values is 1.43 **W/kg (1g)**. The detail for simultaneous transmission consideration is described in chapter 13.

3 Client Information

3.1 Applicant Information

Company Name:	Huawei Technologies Co.,Ltd
Address /Post:	Administration Building,Headquarters of Huawei Technologies Co.,Ltd.,Bantian,Longgang District,Shenzhen,518129,P.R.C
City:	Shenzhen
Postal Code:	518129
Country:	China
Contact Person:	Han Mamao
E-mail:	hanmaomao1@huawei.com
Telephone:	075515814033573
Fax:	/

3.2 Manufacturer Information

Company Name:	Huawei Technologies Co.,Ltd
Address /Post:	Administration Building,Headquarters of Huawei Technologies Co.,Ltd.,Bantian,Longgang District,Shenzhen,518129,P.R.C
City:	Shenzhen
Postal Code:	518129
Country:	China
Contact Person:	Han Mamao
E-mail:	hanmaomao1@huawei.com
Telephone:	075515814033573
Fax:	/

4 Equipment Under Test (EUT) and Ancillary Equipment (AE)

4.1 About EUT

Description:	Tablet
Model name:	AGS2-L09
Operating mode(s):	GSM 850/1900 WCDMA850/1900,LTE B5/7, BT, WiFi 2.4G&5G
Tested Tx Frequency:	824 – 849 MHz (GSM 850)
	1850 – 1910 MHz (GSM 1900)
	824–849 MHz (WCDMA 850 Band V)
	1850–1910 MHz (WCDMA1900 Band II)
	824 – 849 MHz (LTE Band 5)
	2500 – 2570 MHz (LTE Band 7)
	2412 – 2462 MHz (Wi-Fi 2.4G)
Tested Rx Frequency:	869 – 894 MHz (GSM 850)
	1930–1990 MHz (GSM 1900)
	869 – 894 MHz (WCDMA 850 Band V)
	1930–1990 MHz (WCDMA1900 Band II)
	869 – 894 MHz (LTE Band 5)
	2620 – 2690 MHz (LTE Band 7)
	2412 – 2462 MHz (Wi-Fi 2.4G)
GPRS/EGPRS Multislot Class:	12
GPRS capability Class:	B
Test device Production information:	Production unit
Device type:	Portable device

4.2 Internal Identification of EUT used during the test

EUTID	IMEI	HW Version	SW Version
1	**869564035731814**	**A6T6E-2**	**AGS2-L09 8.0.0.18(C432)**
2	**869564035731889**	**A6T6E-2**	**AGS2-L09 8.0.0.18(C432)**
3	**869564035731863**	**A6T6E-2**	**AGS2-L09 8.0.0.18(C432)**

*EUT ID: is used to identify the test sample in the lab internally.

Note: It is performed to test SAR with the EUT1&2 and conducted power with the EUT3.

4.3 Internal Identification of AE used during the test

AE ID	Description	Model	SN	Manufactor
AE1	Battery	HB2899C0ECW-C	/	HuaweiTechnologies Co., Ltd.

*AE ID: is used to identify the test sample in the lab internally.

5 TEST METHODOLOGY

5.1 Applicable Limit Regulations

ANSI C95.1–1992: IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.

It specifies the maximum exposure limit of **1.6 W/kg** as averaged over any 1 gram of tissue for portable devices being used within 20 cm of the user in the uncontrolled environment.

5.2 Applicable Measurement Standards

IEEE 1528:2013 Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques.

KDB447498 D01 General RF Exposure Guidance v06 Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies.

KDB648474 D04 Handset SAR v01r03 SAR Evaluation Considerations for Wireless Handsets.

KDB941225 D01 SAR test for 3G devices v03r01 SAR Measurement Procedures for 3G Devices

KDB941225 D05 SAR for LTE Devices v02r05 SAR Evaluation Considerations for LTE Devices

KDB941225 D06 Hotspot Mode SAR v02r01 SAR Evaluation Procedures for Portable Devices with Wireless Router Capabilities

KDB248227 D01 802.11 Wi-Fi SAR v02r02 SAR GUIDANCE FOR IEEE 802.11 (Wi-Fi) TRANSMITTERS

KDB865664 D01SAR measurement 100 MHz to 6 GHz v01r04 SAR Measurement Requirements for 100 MHz to 6 GHz.

KDB865664 D02RF Exposure Reporting v01r02 RF Exposure Compliance Reporting and Documentation Considerations

6 Specific Absorption Rate (SAR)

6.1 Introduction

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

6.2 SAR Definition

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

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

SAR is expressed in units of Watts per kilogram (W/kg)
SAR measurement can be either related to the temperature elevation in tissue by

$$SAR = c\left(\frac{\delta T}{\delta t}\right)$$

Where: C is the specific head capacity, δT is the temperature rise and δt is the exposure duration, or related to the electrical field in the tissue by

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

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

However for evaluating SAR of low power transmitter, electrical field measurement is typically applied.

7 Tissue Simulating Liquids

7.1 Targets for tissue simulating liquid

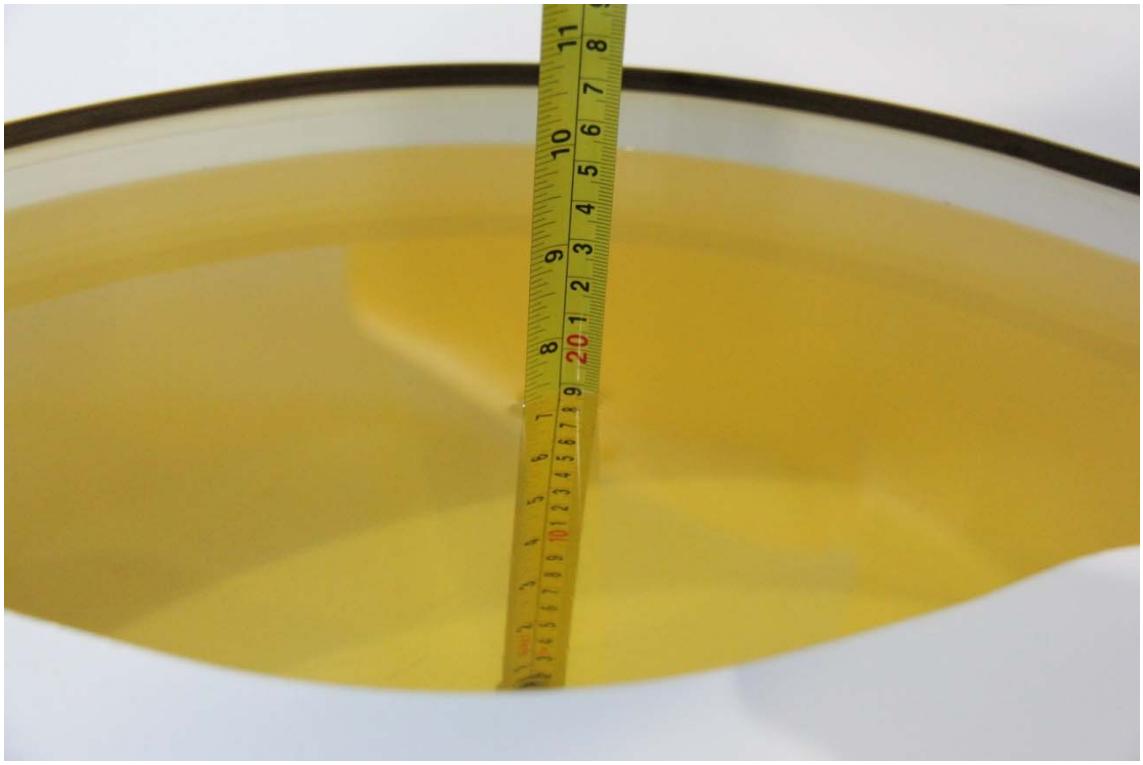
Table 7.1: Targets for tissue simulating liquid

Frequency(MHz)	Liquid Type	Conductivity(σ)	± 5% Range	Permittivity(ε)	± 5% Range
835	Body	0.97	0.92～1.02	55.2	52.4～58.0
1900	Body	1.52	1.44～1.60	53.3	50.6～56.0
2450	Body	1.95	1.85～2.05	52.7	50.1～55.3
2600	Body	2.16	2.05～2.27	52.5	49.9～55.1
5250	Body	5.36	5.09～5.63	48.9	46.5～51.3
5600	Body	5.77	5.48～6.06	48.5	46.1～50.9
5750	Body	5.94	5.64～6.24	48.3	45.9～50.7

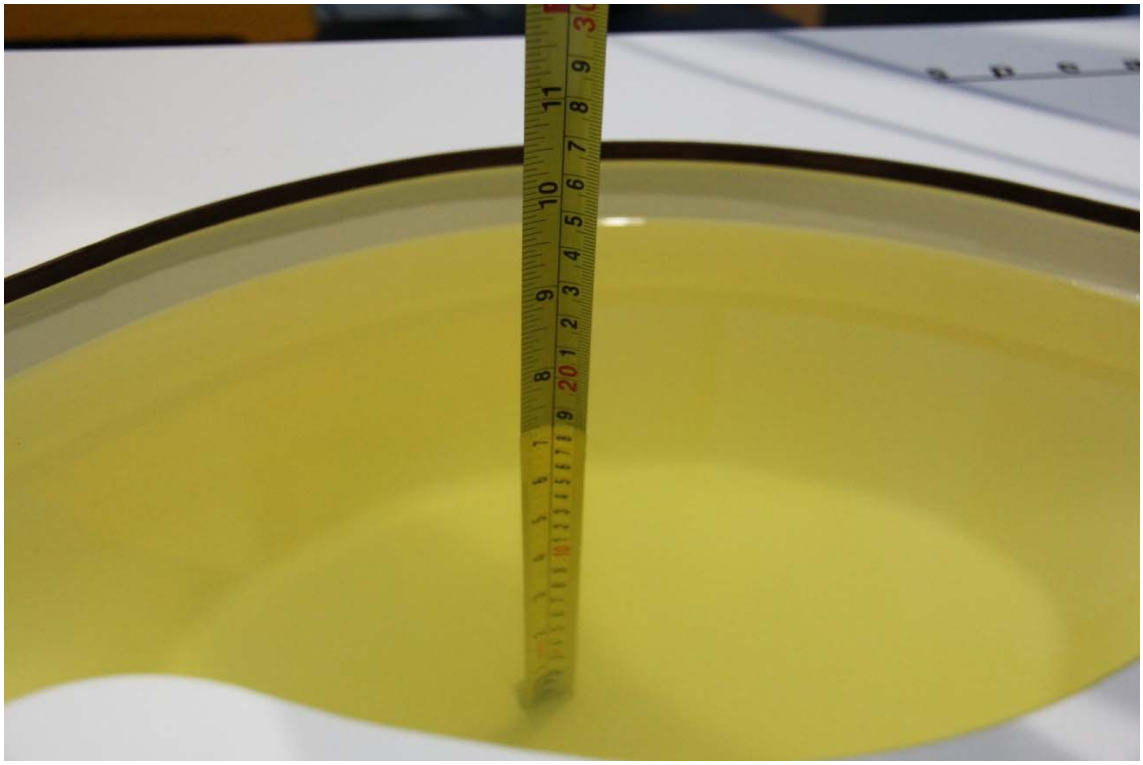
7.2 Dielectric Performance

Table 7.2: Dielectric Performance of Tissue Simulating Liquid

Measurement Date yyyy/mm/dd	Frequency	Type	Permittivity ε	Drift (%)	Conductivity σ (S/m)	Drift (%)
2019/4/14	835 MHz	Body	55.97	1.39	0.982	1.24
2019/4/15	1900 MHz	Body	52.73	-1.07	1.508	-0.79
2019/4/16	2600 MHz	Body	52.94	0.84	2.118	-1.94
2019/5/25	2450 MHz	Body	53.33	1.20	1.919	-1.59

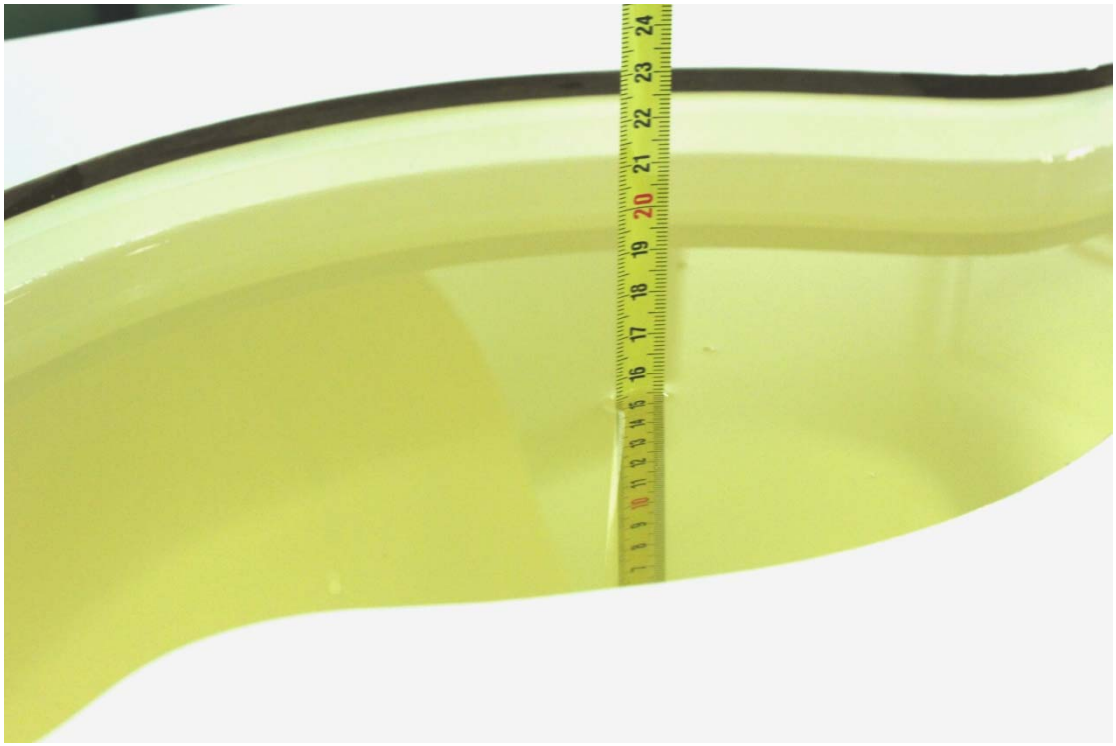


Picture 7-1 Liquid depth in the Flat Phantom (835MHz)



Picture 7-2 Liquid depth in the Flat Phantom (1900MHz)

Picture 7-3 Liquid depth in the Flat Phantom (2600MHz)

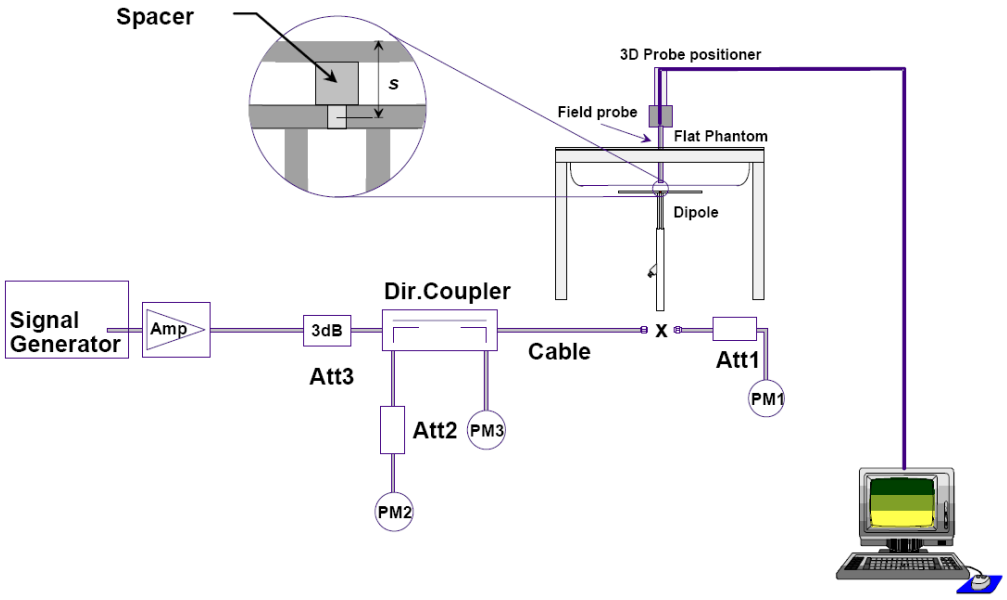


Picture 7-4 Liquid depth in the Flat Phantom (2450MHz)

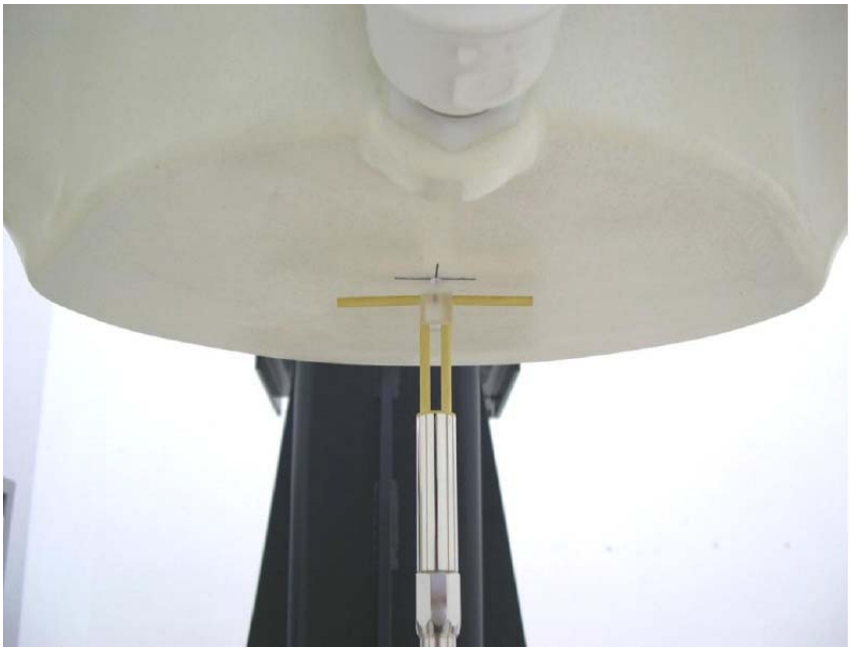
8 System verification

8.1 System Setup

In the simplified setup for system evaluation, the DUT is replaced by a calibrated dipole and the power source is replaced by a continuous wave that comes from a signal generator. The calibrated dipole must be placed beneath the flat phantom section of the SAM twin phantom with the correct distance holder. The distance holder should touch the phantom surface with a light pressure at the reference marking and be oriented parallel to the long side of the phantom. The equipment setup is shown below:



Picture 8.1 System Setup for System Evaluation



Picture 8.2 Photo of Dipole Setup

8.2 System Verification

SAR system verification is required to confirm measurement accuracy, according to the tissue dielectric media, probe calibration points and other system operating parameters required for measuring the SAR of a test device. The system verification must be performed for each frequency band and within the valid range of each probe calibration point required for testing the device.

The system verification results are required that the area scan estimated 1-g SAR is within 3% of the zoom scan 1-g SAR. The details are presented in annex B.

Table 8.1: System Verification of Body

Measurement Date	Frequency	Target value (W/kg)		Measured value (W/kg)		Deviation	
(yyyy-mm-dd)		10 g Average	1 g Average	10 g Average	1 g Average	10 g Average	1 g Average
2019/4/14	835 MHz	6.12	9.41	6.04	9.32	-1.31%	-0.96%
2019/4/15	1900 MHz	21.5	40.5	21.76	40.12	1.21%	-0.94%
2019/4/16	2600 MHz	24.8	55.5	25.04	56.12	0.97%	1.12%
2019/5/25	2450 MHz	23.8	50.4	23.72	50.68	-0.34%	0.56%

9 Measurement Procedures

9.1 Tests to be performed

In order to determine the highest value of the peak spatial-average SAR of a handset, all device positions, configurations and operational modes shall be tested for each frequency band according to steps 1 to 3 below. A flowchart of the test process is shown in picture 9.1.

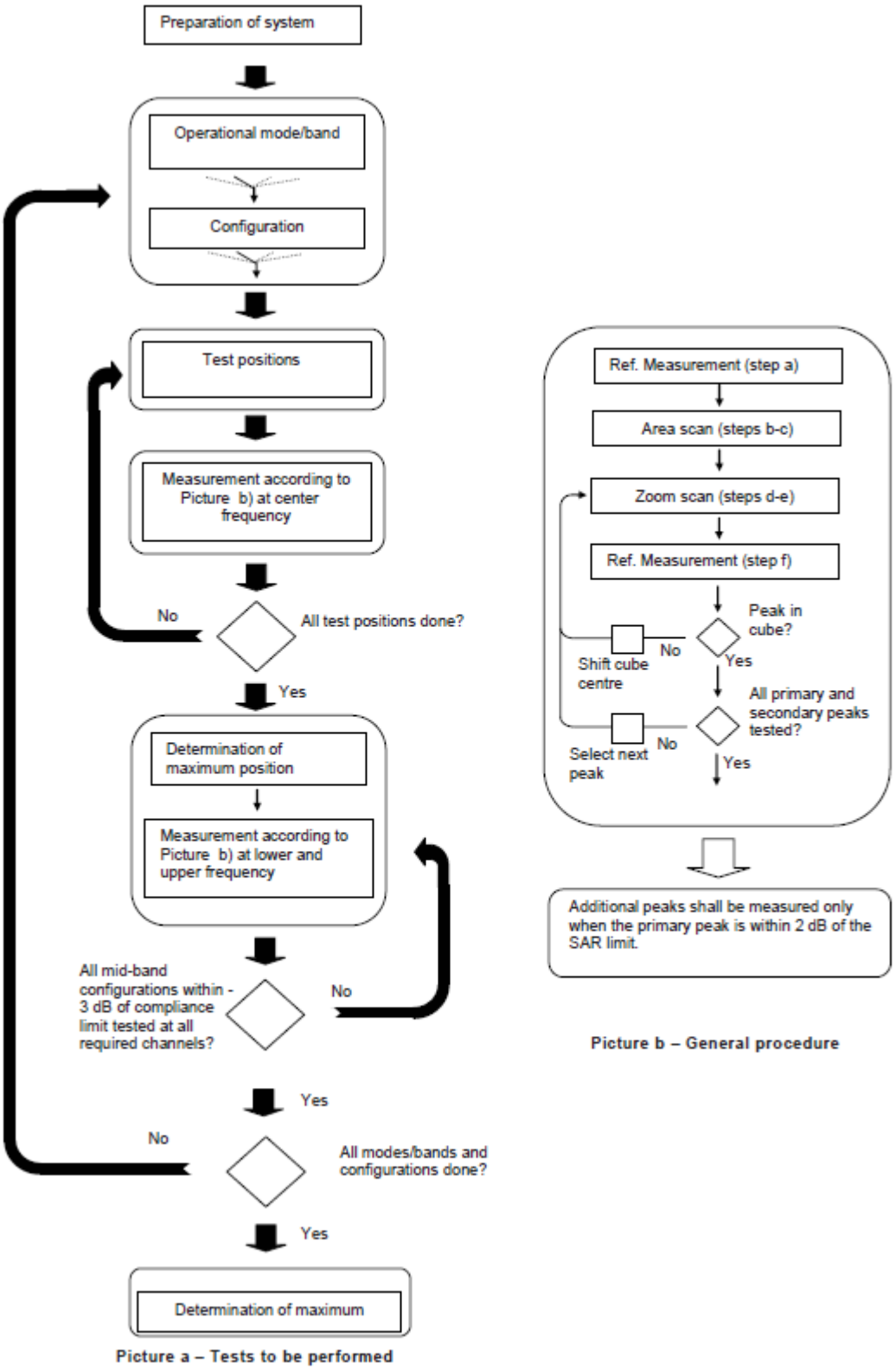
Step 1: The tests described in 9.2 shall be performed at the channel that is closest to the center of the transmit frequency band (f_c) for:

a) all device positions (cheek and tilt, for both left and right sides of the SAM phantom, as described in annex D),
b) all configurations for each device position in a), e.g., antenna extended and retracted, and
c) all operational modes, e.g., analogue and digital, for each device position in a) and configuration in b) in each frequency band.

If more than three frequencies need to be tested according to 11.1 (i.e., N_c > 3), then all frequencies, configurations and modes shall be tested for all of the above test conditions.

Step 2: For the condition providing highest peak spatial-average SAR determined in Step 1, perform all tests described in 9.2 at all other test frequencies, i.e., lowest and highest frequencies. In addition, for all other conditions (device position, configuration and operational mode) where the peak spatial-average SAR value determined in Step 1 is within 3 dB of the applicable SAR limit, it is recommended that all other test frequencies shall be tested as well.

Step 3: Examine all data to determine the highest value of the peak spatial-average SAR found in Steps 1 to 2.



Picture 9.1 Block diagram of the tests to be performed

9.2 General Measurement Procedure

The area and zoom scan resolutions specified in the table below must be applied to the SAR measurements and fully documented in SAR reports to qualify for TCB approval. Probe boundary effect error compensation is required for measurements with the probe tip closer than half a probe tip diameter to the phantom surface. Both the probe tip diameter and sensor offset distance must satisfy measurement protocols; to ensure probe boundary effect errors are minimized and the higher fields closest to the phantom surface can be correctly measured and extrapolated to the phantom surface for computing 1-g SAR. Tolerances of the post-processing algorithms must be verified by the test laboratory for the scan resolutions used in the SAR measurements, according to the reference distribution functions specified in IEEE Std 1528-2013. The results should be documented as part of the system validation records and may be requested to support test results when all the measurement parameters in the following table are not satisfied.

<table>
<tr><td colspan="3"></td><td>≤ 3 GHz</td><td>> 3 GHz</td></tr>
<tr><td colspan="3">Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface</td><td>5 ± 1 mm</td><td>½·δ·ln(2) ± 0.5 mm</td></tr>
<tr><td colspan="3">Maximum probe angle from probe axis to phantom surface normal at the measurement location</td><td>30° ± 1°</td><td>20° ± 1°</td></tr>
<tr><td colspan="3" rowspan="2">Maximum area scan spatial resolution: Δx_{Area}, Δy_{Area}</td><td>≤ 2 GHz: ≤ 15 mm
2 – 3 GHz: ≤ 12 mm</td><td>3 – 4 GHz: ≤ 12 mm
4 – 6 GHz: ≤ 10 mm</td></tr>
<tr><td colspan="2">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.</td></tr>
<tr><td colspan="3">Maximum zoom scan spatial resolution: Δx_{Zoom}, Δy_{Zoom}</td><td>≤ 2 GHz: ≤ 8 mm
2 – 3 GHz: ≤ 5 mm*</td><td>3 – 4 GHz: ≤ 5 mm*
4 – 6 GHz: ≤ 4 mm*</td></tr>
<tr><td rowspan="3">Maximum zoom scan spatial resolution, normal to phantom surface</td><td colspan="2">uniform grid: $\Delta z_{Zoom}(n)$</td><td>≤ 5 mm</td><td>3 – 4 GHz: ≤ 4 mm
4 – 5 GHz: ≤ 3 mm
5 – 6 GHz: ≤ 2 mm</td></tr>
<tr><td rowspan="2">graded grid</td><td>$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface</td><td>≤ 4 mm</td><td>3 – 4 GHz: ≤ 3 mm
4 – 5 GHz: ≤ 2.5 mm
5 – 6 GHz: ≤ 2 mm</td></tr>
<tr><td>$\Delta z_{Zoom}(n>1)$: between subsequent points</td><td colspan="2">≤ 1.5·$\Delta z_{Zoom}(n-1)$</td></tr>
<tr><td>Minimum zoom scan volume</td><td colspan="2">x, y, z</td><td>≥ 30 mm</td><td>3 – 4 GHz: ≥ 28 mm
4 – 5 GHz: ≥ 25 mm
5 – 6 GHz: ≥ 22 mm</td></tr>
<tr><td colspan="5">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 <u>reported</u> 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.</td></tr>
</table>

9.3 WCDMA Measurement Procedures for SAR

The following procedures are applicable to WCDMA handsets operating under 3GPP Release99, Release 5 and Release 6. The default test configuration is to measure SAR with an established radio link between the DUT and a communication test set using a 12.2kbps RMC (reference measurement channel) configured in Test Loop Mode 1. SAR is selectively confirmed for other physical channel configurations (DPCCH & $DPDCH_n$), HSDPA and HSPA (HSUPA/HSDPA) modes according to output power, exposure conditions and device operating capabilities. Both uplink and downlink should be configured with the same RMC or AMR, when required. SAR for Release 5 HSDPA and Release 6 HSPA are measured using the applicable FRC (fixed reference channel) and E-DCH reference channel configurations. Maximum output power is verified according to applicable versions of 3GPP TS 34.121 and SAR must be measured according to these maximum output conditions. When Maximum Power Reduction (MPR) is not implemented according to Cubic Metric (CM) requirements for Release 6 HSPA, the following procedures do not apply.

For Release 5 HSDPA Data Devices:

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{hs}	CM/dB
1	2/15	15/15	64	2/15	4/15	0.0
2	12/15	15/15	64	12/15	24/25	1.0
3	15/15	8/15	64	15/8	30/15	1.5
4	15/15	4/15	64	15/4	30/15	1.5

For Release 6 HSPA Data Devices

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{hs}	β_{ec}	β_{ed}	β_{ed} (SF)	β_{ed} (codes)	CM (dB)	MPR (dB)	AG Index	E-TFCI
1	11/15	15/15	64	11/15	22/15	209/225	1039/225	4	1	1.5	1.5	20	75
2	6/15	15/15	64	6/15	12/15	12/15	12/15	4	1	1.5	1.5	12	67
3	15/15	9/15	64	15/9	30/15	30/15	β_{ed1}:47/15 β_{ed2}:47/15	4	2	1.5	1.5	15	92
4	2/15	15/15	64	2/15	4/15	4/15	56/75	4	1	1.5	1.5	17	71
5	15/15	15/15	64	15/15	24/15	30/15	134/15	4	1	1.5	1.5	21	81

Rel.8 DC-HSDPA (Cat 24)

SAR test exclusion for Rel.8 DC-HSDPA must satisfy the SAR test exclusion requirements of Rel.5 HSDPA. SAR test exclusion for DC-HSDPA devices is determined by power measurements according to the H-Set 12, Fixed Reference Channel (FRC) configuration in Table C.8.1.12 of 3GPP TS 34.121-1. A primary and a secondary serving HS-DSCH Cell are required to perform the power measurement and for the results to qualify for SAR test exclusion.

9.4 SAR Measurement for LTE

SAR tests for LTE are performed with a base station simulator, Rohde & Rchwarz CMW500. Closed loop power control was used so the UE transmits with maximum output power during SAR testing. All powers were measured with the CMW 500.
It is performed for conducted power and SAR based on the KDB941225 D05.
SAR is evaluated separately according to the following procedures for the different test positions in each exposure condition – head, body, body-worn accessories and other use conditions. The procedures in the following subsections are applied separately to test each LTE frequency band.

1) QPSK with 1 RB allocation
   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 among RB offsets at the upper edge, middle and lower edge of each required test channel. When the reported SAR is ≤ 0.8 W/kg, testing of the remaining RB offset configurations and required test channels is not required for 1 RB allocation; otherwise, SAR is required for the remaining required test channels and only for the RB offset configuration with the highest output power for that channel. When the reported SAR of a required test channel is > 1.45 W/kg, SAR is required for all three RB offset configurations for that required test channel.
2) QPSK with 50% RB allocation
   The procedures required for 1 RB allocation in 1) are applied to measure the SAR for QPSK with 50% RB allocation.
3) QPSK with 100% RB allocation
   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 in 1) and 2) 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.

9.5 Bluetooth & Wi-Fi Measurement Procedures for SAR

Normal network operating configurations are not suitable for measuring the SAR of 802.11 transmitters in general. Unpredictable fluctuations in network traffic and antenna diversity conditions can introduce undesirable variations in SAR results. The SAR for these devices should be measured using chipset based test mode software to ensure that the results are consistent and reliable.
Chipset based test mode software is hardware dependent and generally varies among manufacturers. The device operating parameters established in a test mode for SAR measurements must be identical to those programmed in production units, including output power levels, amplifier gain settings and other RF performance tuning parameters. The test frequencies should correspond to actual channel frequencies defined for domestic use. SAR for devices with switched diversity should be measured with only one antenna transmitting at a time during each SAR measurement, according to a fixed modulation and data rate. The same data pattern should be used for all measurements.

9.6 Power Drift

To control the output power stability during the SAR test, DASY4 system calculates the power drift by measuring the E-field at the same location at the beginning and at the end of the measurement for each test position. These drift values can be found in section 14 labeled as: (Power Drift [dB]). This ensures that the power drift during one measurement is within 5%.

10 Area Scan Based 1-g SAR

10.1 Requirement of KDB

According to the KDB447498 D01 v06, when the implementation is based the specific polynomial fit
algorithm as presented at the 29th Bioelectromagnetics Society meeting (2007) and the estimated 1-g SAR is ≤ 1.2 W/kg, a zoom scan measurement is not required provided it is also not needed for any other purpose; for example, if the peak SAR location required for simultaneous transmission SAR test exclusion can be determined accurately by the SAR system or manually to discriminate between distinctive peaks and scattered noisy SAR distributions from area scans.

There must not be any warning or alert messages due to various measurement concerns identified by the SAR system; for example, noise in measurements, peaks too close to scan boundary, peaks are too sharp, spatial resolution and uncertainty issues etc. The SAR system verification must also demonstrate that the area scan estimated 1-g SAR is within 3% of the zoom scan 1-g SAR (See Annex B). When all the SAR results for each exposure condition in a frequency band and wireless mode are based on estimated 1-g SAR, the 1-g SAR for the highest SAR configuration must be determined by a zoom scan.

10.2 Fast SAR Algorithms

The approach is based on the area scan measurement applying a frequency dependent attenuation parameter. This attenuation parameter was empirically determined by analyzing a large number of phones. The MOTOROLA FAST SAR was developed and validated by the MOTOROLA Research Group in Ft. Lauderdale.

In the initial study, an approximation algorithm based on Linear fit was developed. The accuracy of the algorithm has been demonstrated across a broad frequency range (136-2450 MHz) and for both 1- and 10-g averaged SAR using a sample of 264 SAR measurements from 55 wireless handsets. For the sample size studied, the root-mean-squared errors of the algorithm are 1.2% and 5.8% for 1- and 10-g averaged SAR, respectively. The paper describing the algorithm in detail is expected to be published in August 2004 within the Special Issue of Transactions on MTT.

In the second step, the same research group optimized the fitting algorithm to an Polynomial fit whereby the frequency validity was extended to cover the range 30-6000MHz. Details of this study can be found in the BEMS 2007 Proceedings.
Both algorithms are implemented in DASY software.

11 Conducted Output Power

11.1 GSM Measurement result

During the process of testing, the EUT was controlled via Digital Radio Communication tester to ensure the maximum power transmission and proper modulation. This result contains conducted output power for the EUT. In all cases, the measured peak output power should be greater and within 5% than EMI measurement.

Table 11-1 GSM850 #1 Sensor OFF

GSM850 #1								
		Measured Power (dBm)			Caculation	Frame Burst Power （dBm）		
Config	Tune-up	CH251 848.8 MHz	CH190 836.6 MHz	CH128 824.2 MHz		CH251 848.8 MHz	CH190 836.6 MHz	CH128 824.2 MHz
GSM Speech	34.00	33.04	32.96	32.80				
GPRS 1 Txslot	33.50	32.45	32.16	32.01	-9.03	23.42	23.13	22.98
GPRS 2 Txslots	32.50	30.97	30.94	30.75	-6.02	24.95	24.92	24.73
GPRS 3 Txslots	30.50	29.03	29.01	28.90	-4.26	24.77	24.75	24.64
GPRS 4 Txslots	29.50	27.93	27.98	27.97	-3.01	24.92	24.97	24.96
EGPRS GMSK 1 Txslot	33.80	32.42	32.10	31.97	-9.03	23.39	23.07	22.94
EGPRS GMSK 2 Txslots	32.50	30.96	30.88	30.77	-6.02	24.94	24.86	24.75
EGPRS GMSK 3 Txslots	30.50	29.12	29.04	28.97	-4.26	24.86	24.78	24.71
EGPRS GMSK 4 Txslots	29.50	28.12	28.08	28.01	-3.01	25.11	25.07	25.00
EGPRS 8PSK 1 Txslot	27.50	26.43	26.23	26.28	-9.03	17.40	17.20	17.25
EGPRS 8PSK 2 Txslots	26.00	24.44	24.57	24.27	-6.02	18.42	18.55	18.25
EGPRS 8PSK 3 Txslots	24.00	22.36	22.38	22.65	-4.26	18.10	18.12	18.39
EGPRS 8PSK 4 Txslots	22.50	21.07	21.09	21.11	-3.01	18.06	18.08	18.10

Table 11-2 GSM850 #2 Sensor On

GSM850 #2								
		Measured Power (dBm)			Caculation	Frame Burst Power （dBm）		
Config	Tune-up	CH251 848.8 MHz	CH190 836.6 MHz	CH128 824.2 MHz		CH251 848.8 MHz	CH190 836.6 MHz	CH128 824.2 MHz
GSM Speech	26.50	25.63	25.59	25.38				
GPRS 1 Txslot	26.50	25.62	25.59	25.41	-9.03	16.59	16.56	16.38
GPRS 2 Txslots	24.50	23.79	23.79	23.61	-6.02	17.77	17.77	17.59
GPRS 3 Txslots	22.50	21.87	21.84	21.65	-4.26	17.61	17.58	17.39
GPRS 4 Txslots	21.50	20.77	20.78	20.58	-3.01	17.76	17.77	17.57
EGPRS GMSK 1 Txslot	26.50	25.58	25.57	25.37	-9.03	16.55	16.54	16.34
EGPRS GMSK 2 Txslots	24.50	23.76	23.77	23.57	-6.02	17.74	17.75	17.55
EGPRS GMSK 3 Txslots	22.50	21.84	21.83	21.61	-4.26	17.58	17.57	17.35
EGPRS GMSK 4 Txslots	21.50	20.76	20.77	20.55	-3.01	17.75	17.76	17.54
EGPRS 8PSK 1 Txslot	17.50	16.51	16.52	16.40	-9.03	7.48	7.49	7.37
EGPRS 8PSK 2 Txslots	16.50	14.83	14.85	14.69	-6.02	8.81	8.83	8.67
EGPRS 8PSK 3 Txslots	14.50	12.86	12.95	12.87	-4.26	8.60	8.69	8.61
EGPRS 8PSK 4 Txslots	12.50	11.52	11.49	11.36	-3.01	8.51	8.48	8.35

Table 11-3 PCS1900 #1 Sensor OFF

PCS1900 #1								
		Measured Power (dBm)			Caculation	Frame Burst Power （dBm）		
Config	Tune-up	CH810 1909.8 MHz	CH661 1880 MHz	CH512 1850.2 MHz		CH810 1909.8 MHz	CH661 1880 MHz	CH512 1850.2 MHz
GSM Speech	31.00	29.68	29.67	29.64				
GPRS 1 Txslot	31.00	29.55	29.49	29.45	-9.03	20.52	20.46	20.42
GPRS 2 Txslots	29.50	27.72	27.71	27.66	-6.02	21.70	21.69	21.64
GPRS 3 Txslots	27.00	25.44	25.39	25.37	-4.26	21.18	21.13	21.11
GPRS 4 Txslots	26.00	24.20	24.17	24.16	-3.01	21.19	21.16	21.15
EGPRS GMSK 1 Txslot	31.00	29.50	29.46	29.41	-9.03	20.47	20.43	20.38
EGPRS GMSK 2 Txslots	29.50	27.76	27.67	27.62	-6.02	21.74	21.65	21.60
EGPRS GMSK 3 Txslots	27.00	25.41	25.36	25.33	-4.26	21.15	21.10	21.07
EGPRS GMSK 4 Txslots	26.00	24.17	24.13	24.12	-3.01	21.16	21.12	21.11
EGPRS 8PSK 1 Txslot	27.20	25.75	25.67	25.46	-9.03	16.72	16.64	16.43
EGPRS 8PSK 2 Txslots	25.00	23.68	23.52	23.32	-6.02	17.66	17.50	17.30
EGPRS 8PSK 3 Txslots	23.00	21.41	21.42	21.31	-4.26	17.15	17.16	17.05
EGPRS 8PSK 4 Txslots	22.00	20.27	20.22	20.19	-3.01	17.26	17.21	17.18

Table 11-4 PCS1900 #2 Sensor On

PCS1900 #2								
		Measured Power (dBm)			Caculation	Frame Burst Power （dBm）		
Config	Tune-up	CH810 1909.8 MHz	CH661 1880 MHz	CH512 1850.2 MHz		CH810 1909.8 MHz	CH661 1880 MHz	CH512 1850.2 MHz
GSM Speech	19.00	17.44	17.37	17.38				
GPRS 1 Txslot	19.00	17.46	17.38	17.37	-9.03	8.43	8.35	8.34
GPRS 2 Txslots	17.00	15.57	15.48	15.48	-6.02	9.55	9.46	9.46
GPRS 3 Txslots	15.00	13.24	13.15	13.14	-4.26	8.98	8.89	8.88
GPRS 4 Txslots	14.00	12.27	12.18	12.17	-3.01	9.26	9.17	9.16
EGPRS GMSK 1 Txslot	19.00	17.45	17.38	17.36	-9.03	8.42	8.35	8.33
EGPRS GMSK 2 Txslots	17.00	15.56	15.49	15.47	-6.02	9.54	9.47	9.45
EGPRS GMSK 3 Txslots	15.00	13.24	13.15	13.13	-4.26	8.98	8.89	8.87
EGPRS GMSK 4 Txslots	14.00	12.27	12.19	12.16	-3.01	9.26	9.18	9.15
EGPRS 8PSK 1 Txslot	13.50	11.59	11.55	11.73	-9.03	2.56	2.52	2.70
EGPRS 8PSK 2 Txslots	11.00	9.71	9.53	9.37	-6.02	3.69	3.51	3.35
EGPRS 8PSK 3 Txslots	9.50	7.64	7.70	7.72	-4.26	3.38	3.44	3.46
EGPRS 8PSK 4 Txslots	8.00	6.70	6.57	6.48	-3.01	3.69	3.56	3.47

NOTES:

Division Factors

To average the power, the division factor is as follows:

1TX-slot = 1 transmit time slot out of 8 time slots=> conducted power divided by (8/1) => -9.03dB

2TX-slots = 2 transmit time slots out of 8 time slots=> conducted power divided by (8/2) => -6.02dB

3TX-slots = 3 transmit time slots out of 8 time slots=> conducted power divided by (8/3) => -4.26dB

4TX-slots = 4 transmit time slots out of 8 time slots=> conducted power divided by (8/4) => -3.01dB

According to the conducted power as above:

1. **The body measurements are performed with 4Txslots for 850MHz (Sensor OFF) and 2Txslots for 1900MHz (Sensor OFF).**
2. **The body measurements are performed with 2Txslots for 850MHz GPRS and 4Txslots for EGPRS (Sensor ON), and 2Txslots for 1900MHz (Sensor ON).**

11.2 WCDMA Measurement result

Table 11-5 WCDMA1900-BII #1 Sensor OFF

WCDMA1900-BII #1					
			Measured Power (dBm)		
Item		Tune-up	CH9538 1907.6 MHz	CH9400 1880 MHz	CH9262 1852.4 MHz
WCDMA	RMC	23.00	21.58	21.62	21.61
HSDPA	subtest1	23.00	22.01	22.04	22.09
	subtest2	23.00	22.05	22.01	22.05
	subtest3	23.00	21.86	21.90	21.92
	subtest4	23.00	21.87	21.91	21.89
HSUPA	subtest1	21.50	21.46	21.49	21.35
	subtest2	22.00	21.23	21.46	21.40
	subtest3	21.50	21.01	21.17	21.25
	subtest4	22.00	21.37	21.61	21.51
	subtest5	18.00	17.43	17.49	17.58
HSPA+	\	20.00	19.62	19.63	19.72
DC-HSDPA	subtest1	22.50	22.01	22.03	22.12
	subtest2	22.50	21.98	22.01	22.11
	subtest3	22.50	21.82	21.86	21.95
	subtest4	22.50	21.84	21.87	21.93

Table 11-6 WCDMA1900-BII #2 Sensor ON

WCDMA1900-BII #2					
			Measured Power (dBm)		
Item		Tune-up	CH9538 1907.6 MHz	CH9400 1880 MHz	CH9262 1852.4 MHz
WCDMA	RMC	7.50	5.84	5.98	5.66
HSDPA	subtest1	6.00	4.45	4.54	4.22
	subtest2	7.00	5.73	5.71	5.44
	subtest3	7.00	5.32	5.42	5.14
	subtest4	7.00	5.31	5.41	5.13
HSUPA	subtest1	5.50	4.92	5.04	4.72
	subtest2	5.00	4.77	4.90	4.78
	subtest3	5.50	4.48	4.59	4.28
	subtest4	5.00	4.43	4.53	4.26
	subtest5	7.50	5.81	5.91	5.63
HSPA+	\	7.00	5.49	5.52	5.18
DC-HSDPA	subtest1	5.00	3.51	3.67	3.39
	subtest2	6.00	5.79	5.88	5.45
	subtest3	5.50	5.26	5.38	5.08
	subtest4	5.50	5.27	5.36	5.07

Table 11-7 WCDMA850-BV #1 Sensor OFF

WCDMA850-BV #1					
			Measured Power (dBm)		
Item		Tune-up	CH4233 846.6 MHz	CH4183 836.6 MHz	CH4132 826.4 MHz
WCDMA	RMC	25.50	23.75	23.73	23.67
HSDPA	subtest1	25.50	23.67	23.61	23.57
	subtest2	25.50	23.62	23.66	23.65
	subtest3	24.50	23.02	23.01	22.98
	subtest4	24.50	23.01	22.98	22.99
HSUPA	subtest1	23.50	22.74	22.75	22.86
	subtest2	22.00	20.72	21.15	20.99
	subtest3	23.50	23.07	23.15	22.85
	subtest4	22.00	21.22	21.20	21.47
	subtest5	22.50	21.83	21.81	21.68
HSPA+	\	22.50	21.79	21.80	21.82
DC-HSDPA	subtest1	24.50	23.61	23.68	23.66
	subtest2	24.50	23.67	23.69	23.68
	subtest3	24.00	23.03	23.06	23.05
	subtest4	24.00	23.01	23.05	23.07

Table 11-8 WCDMA850-BV #2 Sensor ON

WCDMA850-BV #2					
			Measured Power (dBm)		
Item		Tune-up	CH4233 846.6 MHz	CH4183 836.6 MHz	CH4132 826.4 MHz
WCDMA	RMC	16.00	14.47	14.44	14.65
HSDPA	subtest1	15.00	13.17	13.15	13.25
	subtest2	15.50	14.22	14.15	14.37
	subtest3	15.50	13.89	13.77	13.99
	subtest4	15.50	13.87	13.74	13.96
HSUPA	subtest1	15.00	13.82	14.11	13.83
	subtest2	14.50	13.59	13.92	13.46
	subtest3	15.00	13.45	13.83	13.40
	subtest4	14.50	13.39	13.79	13.36
	subtest5	16.00	14.79	14.74	14.57
HSPA+	\	15.50	14.11	14.07	14.16
DC-HSDPA	subtest1	14.00	12.31	12.29	12.43
	subtest2	15.00	14.26	14.12	14.34
	subtest3	15.00	13.81	13.77	13.94
	subtest4	15.00	13.80	13.76	13.96

11.3 LTE Measurement result

Table 11-9 LTE850-FDD5 #1 Sensor OFF

LTE850-FDD5 #1							
				Measured Power (dBm) & MPR			
				QPSK		16QAM	
BandWidth	RB No./Start	Channel	Tune-up	Measured Power	MPR	Measured Power	MPR
1.4MHz	1H	20643	25.5	23.73	0	23.56	1
		20525	25.5	23.51	0	22.98	1
		20407	25.5	23.61	0	23.43	1
	1M	20643	25.5	23.89	0	23.56	1
		20525	25.5	23.55	0	23.11	1
		20407	25.5	23.74	0	23.57	1
	1L	20643	25.5	23.80	0	23.64	1
		20525	25.5	23.52	0	23.08	1
		20407	25.5	23.66	0	23.61	1
	3H	20643	25.5	23.71	0	23.26	1
		20525	25.5	23.65	0	22.92	1
		20407	25.5	23.70	0	23.34	1
	3M	20643	25.5	23.79	0	23.35	1
		20525	25.5	23.51	0	23.10	1
		20407	25.5	23.75	0	23.39	1
	3L	20643	25.5	23.81	0	23.40	1
		20525	25.5	23.69	0	22.97	1
		20407	25.5	23.73	0	23.14	1
	6	20643	25.5	23.28	1	22.21	2
		20525	25.5	22.98	1	22.13	2
		20407	25.5	23.21	1	22.06	2
3MHz	1H	20635	25.5	23.52	0	22.85	1
		20525	25.5	23.54	0	23.11	1
		20415	25.5	23.67	0	23.32	1
	1M	20635	25.5	23.88	0	23.38	1
		20525	25.5	23.61	0	23.30	1
		20415	25.5	23.84	0	23.63	1
	1L	20635	25.5	23.58	0	23.17	1
		20525	25.5	23.58	0	23.13	1
		20415	25.5	23.50	0	23.40	1
	8H	20635	25.5	23.20	1	22.28	2
		20525	25.5	22.96	1	22.12	2
		20415	25.5	23.10	1	22.04	2
	8M	20635	25.5	23.29	1	22.41	2
		20525	25.5	22.99	1	22.14	2
		20415	25.5	23.27	1	22.27	2
	8L	20635	25.5	23.23	1	22.31	2
		20525	25.5	22.98	1	22.14	2
		20415	25.5	23.19	1	22.19	2
	15	20635	25.5	23.29	1	22.34	2
		20525	25.5	22.95	1	21.99	2
		20415	25.5	23.18	1	22.16	2
5MHz	1H	20625	25.5	23.80	0	23.57	1
		20525	25.5	23.64	0	23.39	1
		20425	25.5	23.79	0	23.60	1
	1M	20625	25.5	23.91	0	23.71	1
		20525	25.5	23.60	0	23.34	1
		20425	25.5	23.86	0	23.63	1
	1L	20625	25.5	24.35	0	24.11	1
		20525	25.5	24.22	0	23.86	1
		20425	25.5	24.26	0	24.05	1
	12H	20625	25.5	23.14	1	22.14	2
		20525	25.5	22.91	1	21.95	2
		20425	25.5	23.07	1	22.06	2
	12M	20625	25.5	23.34	1	22.43	2
		20525	25.5	23.06	1	22.24	2
		20425	25.5	23.32	1	22.28	2
	12L	20625	25.5	23.17	1	22.23	2
		20525	25.5	23.04	1	22.10	2
		20425	25.5	23.23	1	22.18	2
	25	20625	25.5	23.21	1	22.26	2
		20525	25.5	22.99	1	22.06	2
		20425	25.5	23.13	1	22.09	2

10MHz	1H	20600	25.5	23.85	0	23.54	1
		20525	25.5	23.79	0	**23.52**	1
		20450	25.5	23.67	0	23.43	1
	1M	20600	25.5	23.77	0	**23.65**	1
		20525	25.5	23.51	0	22.87	1
		20450	25.5	23.67	0	23.36	1
	1L	20600	25.5	23.73	0	23.48	1
		20525	25.5	23.83	0	23.47	1
		20450	25.5	23.81	0	**23.53**	1
	25H	20600	25.5	22.97	1	21.99	2
		20525	25.5	22.70	1	21.78	2
		20450	25.5	22.88	1	21.88	2
	25M	20600	25.5	23.09	1	22.11	2
		20525	25.5	22.98	1	22.01	2
		20450	25.5	23.11	1	22.17	2
	25L	20600	25.5	22.93	1	21.97	2
		20525	25.5	22.87	1	21.89	2
		20450	25.5	22.98	1	21.91	2
	50	20600	25.5	22.93	1	21.94	2
		20525	25.5	22.81	1	21.85	2
		20450	25.5	22.90	1	21.97	2

Table 11-10 LTE850-FDD5 #2 Sensor ON

LTE850-FDD5 #2							
				Measured Power (dBm) & MPR			
				QPSK		16QAM	
BandWidth	RB No./Start	Channel	Tune-up	Measured Power	MPR	Measured Power	MPR
1.4MHz	1H	20643	15.5	13.78	0	13.29	1
		20525	15.5	13.50	0	13.02	1
		20407	15.5	13.70	0	13.23	1
	1M	20643	15.5	13.85	0	13.52	1
		20525	15.5	13.61	0	13.27	1
		20407	15.5	13.78	0	13.51	1
	1L	20643	15.5	13.83	0	13.14	1
		20525	15.5	13.60	0	13.26	1
		20407	15.5	13.71	0	13.43	1
	3H	20643	15.5	13.71	0	13.22	1
		20525	15.5	13.55	0	13.06	1
		20407	15.5	13.68	0	13.17	1
	3M	20643	15.5	13.78	0	13.31	1
		20525	15.5	13.67	0	13.14	1
		20407	15.5	13.80	0	13.24	1
	3L	20643	15.5	13.84	0	13.29	1
		20525	15.5	13.65	0	13.26	1
		20407	15.5	13.78	0	13.47	1
	6	20643	15.5	13.26	1	12.45	2
		20525	15.5	13.13	1	12.04	2
		20407	15.5	13.27	1	12.37	2
3MHz	1H	20635	15.5	13.60	0	13.15	1
		20525	15.5	13.57	0	13.22	1
		20415	15.5	13.59	0	13.04	1
	1M	20635	15.5	13.88	0	13.60	1
		20525	15.5	13.72	0	13.46	1
		20415	15.5	13.80	0	13.33	1
	1L	20635	15.5	13.72	0	13.39	1
		20525	15.5	13.60	0	13.31	1
		20415	15.5	13.55	0	12.84	1
	8H	20635	15.5	13.24	1	12.19	2
		20525	15.5	13.09	1	12.02	2
		20415	15.5	13.17	1	12.16	2
	8M	20635	15.5	13.34	1	12.32	2
		20525	15.5	13.14	1	12.05	2
		20415	15.5	13.30	1	12.26	2
	8L	20635	15.5	13.27	1	12.30	2
		20525	15.5	13.17	1	12.18	2
		20415	15.5	13.22	1	12.13	2
	15	20635	15.5	13.30	1	12.32	2
		20525	15.5	13.09	1	12.01	2
		20415	15.5	13.22	1	12.25	2
5MHz	1H	20625	15.5	13.77	0	13.51	1
		20525	15.5	13.68	0	13.43	1
		20425	15.5	13.82	0	13.65	1
	1M	20625	15.5	13.85	0	13.64	1
		20525	15.5	13.77	0	13.37	1
		20425	15.5	13.87	0	13.63	1
	1L	20625	15.5	13.79	0	13.48	1
		20525	15.5	13.58	0	13.29	1
		20425	15.5	13.71	0	13.53	1
	12H	20625	15.5	13.16	1	12.19	2
		20525	15.5	13.02	1	12.16	2
		20425	15.5	13.13	1	12.08	2
	12M	20625	15.5	13.38	1	12.38	2
		20525	15.5	13.16	1	12.08	2
		20425	15.5	13.37	1	12.40	2
	12L	20625	15.5	13.28	1	12.30	2
		20525	15.5	13.15	1	12.07	2
		20425	15.5	13.24	1	12.24	2
	25	20625	15.5	13.22	1	12.20	2
		20525	15.5	13.11	1	12.10	2
		20425	15.5	13.13	1	12.13	2

10MHz	1H	20600	15.5	13.73	0	**13.61**	1
		20525	15.5	13.62	0	13.42	1
		20450	15.5	13.59	0	13.51	1
	1M	20600	15.5	13.88	0	13.53	1
		20525	15.5	13.70	0	13.51	1
		20450	15.5	13.79	0	13.44	1
	1L	20600	15.5	13.70	0	13.33	1
		20525	15.5	13.78	0	**13.64**	1
		20450	15.5	13.91	0	**13.60**	1
	25H	20600	15.5	13.03	1	12.02	2
		20525	15.5	12.84	1	11.79	2
		20450	15.5	12.96	1	11.92	2
	25M	20600	15.5	13.14	1	12.13	2
		20525	15.5	13.12	1	12.12	2
		20450	15.5	13.23	1	12.13	2
	25L	20600	15.5	13.03	1	11.96	2
		20525	15.5	13.03	1	11.96	2
		20450	15.5	13.08	1	11.98	2
	50	20600	15.5	12.98	1	11.78	2
		20525	15.5	12.96	1	11.86	2
		20450	15.5	13.04	1	11.95	2

Table 11-11 LTE2500-FDD7 #1 Sensor OFF

LTE2500-FDD7 #1							
				Measured Power (dBm) & MPR			
				QPSK		16QAM	
BandWidth	RB No./Start	Channel	Tune-up	Measured Power	MPR	Measured Power	MPR
5MHz	1H	21425	24	22.43	0	21.88	1
		21100	24	22.57	0	21.94	1
		20775	24	22.81	0	22.18	1
	1M	21425	24	22.95	0	22.19	1
		21100	24	22.91	0	22.16	1
		20775	24	23.16	0	22.51	1
	1L	21425	24	23.22	0	22.56	1
		21100	24	23.32	0	22.63	1
		20775	24	23.45	0	22.77	1
	12H	21425	24	21.94	1	21.17	2
		21100	24	21.95	1	21.24	2
		20775	24	22.23	1	21.45	2
	12M	21425	24	22.13	1	21.39	2
		21100	24	22.12	1	21.35	2
		20775	24	22.43	1	21.60	2
	12L	21425	24	22.16	1	21.43	2
		21100	24	22.18	1	21.45	2
		20775	24	22.38	1	21.51	2
	25	21425	24	22.48	1	21.66	2
		21100	24	22.09	1	21.27	2
		20775	24	22.32	1	21.42	2
10MHz	1H	21400	24	22.41	0	21.58	1
		21100	24	22.49	0	21.83	1
		20800	24	22.88	0	21.93	1
	1M	21400	24	22.74	0	21.92	1
		21100	24	22.66	0	21.97	1
		20800	24	22.87	0	21.95	1
	1L	21400	24	23.00	0	22.63	1
		21100	24	23.06	0	22.34	1
		20800	24	22.97	0	22.26	1
	25H	21400	24	22.21	1	21.42	2
		21100	24	21.72	1	20.96	2
		20800	24	21.98	1	21.13	2
	25M	21400	24	22.21	1	21.38	2
		21100	24	21.87	1	21.10	2
		20800	24	22.19	1	21.26	2
	25L	21400	24	22.01	1	21.25	2
		21100	24	21.95	1	21.14	2
		20800	24	22.08	1	21.16	2
	50	21400	24	22.23	1	21.41	2
		21100	24	21.87	1	21.04	2
		20800	24	22.13	1	21.21	2
15MHz	1H	21375	24	22.53	0	21.85	1
		21100	24	22.58	0	21.73	1
		20825	24	22.88	0	22.08	1
	1M	21375	24	22.96	0	22.28	1
		21100	24	22.78	0	21.88	1
		20825	24	23.01	0	22.14	1
	1L	21375	24	23.04	0	22.38	1
		21100	24	22.88	0	22.07	1
		20825	24	22.88	0	22.18	1
	36H	21375	24	22.22	1	21.36	2
		21100	24	21.82	1	21.03	2
		20825	24	22.13	1	21.25	2
	36M	21375	24	22.19	1	21.39	2
		21100	24	21.99	1	21.18	2
		20825	24	22.13	1	21.28	2
	36L	21375	24	22.15	1	21.36	2
		21100	24	21.98	1	21.17	2
		20825	24	22.08	1	21.17	2
	75	21375	24	22.28	1	21.44	2
		21100	24	21.89	1	21.11	2
		20825	24	22.16	1	21.28	2

20MHz	1H	21350	24	22.34	0	21.72	1
		21100	24	22.48	0	21.81	1
		20850	24	22.74	0	22.17	1
	1M	21350	24	22.85	0	**22.13**	1
		21100	24	22.68	0	21.93	1
		20850	24	22.95	0	22.28	1
	1L	21350	24	22.75	0	22.07	1
		21100	24	22.70	0	**22.04**	1
		20850	24	22.80	0	**22.29**	1
	50H	21350	24	22.14	1	21.29	2
		21100	24	21.78	1	20.97	2
		20850	24	22.19	1	21.35	2
	50M	21350	24	22.15	1	21.35	2
		21100	24	21.97	1	21.19	2
		20850	24	22.19	1	21.29	2
	50L	21350	24	22.00	1	21.17	2
		21100	24	22.11	1	21.27	2
		20850	24	21.99	1	21.15	2
	100	21350	24	22.18	1	21.37	2
		21100	24	21.93	1	21.04	2
		20850	24	22.14	1	21.26	2

Table 11-12 LTE2500-FDD7 #2 Sensor ON

LTE2500-FDD7 #2							
				Measured Power (dBm) & MPR			
				QPSK		16QAM	
BandWidth	RB No./Start	Channel	Tune-up	Measured Power	MPR	Measured Power	MPR
5MHz	1H	21425	6.5	5.33	0	4.56	1
		21100	6.5	5.20	0	4.64	1
		20775	6.5	5.32	0	4.65	1
	1M	21425	6.5	5.85	0	5.09	1
		21100	6.5	5.80	0	5.24	1
		20775	6.5	5.87	0	5.19	1
	1L	21425	6.5	6.11	0	5.33	1
		21100	6.5	6.07	0	5.44	1
		20775	6.5	6.11	0	5.39	1
	12H	21425	6.5	4.71	1	3.95	2
		21100	6.5	4.64	1	3.90	2
		20775	6.5	4.73	1	4.03	2
	12M	21425	6.5	4.90	1	4.24	2
		21100	6.5	4.90	1	4.15	2
		20775	6.5	4.99	1	4.20	2
	12L	21425	6.5	4.87	1	4.09	2
		21100	6.5	4.94	1	4.18	2
		20775	6.5	4.91	1	4.16	2
	25	21425	6.5	5.25	1	4.45	2
		21100	6.5	4.81	1	4.01	2
		20775	6.5	4.85	1	4.09	2
10MHz	1H	21400	6.5	5.28	0	4.56	1
		21100	6.5	5.15	0	4.54	1
		20800	6.5	5.24	0	4.50	1
	1M	21400	6.5	5.59	0	4.93	1
		21100	6.5	5.51	0	4.82	1
		20800	6.5	5.60	0	4.93	1
	1L	21400	6.5	5.67	0	5.00	1
		21100	6.5	5.60	0	5.00	1
		20800	6.5	5.72	0	4.95	1
	25H	21400	6.5	4.98	1	4.19	2
		21100	6.5	4.43	1	3.64	2
		20800	6.5	4.52	1	3.71	2
	25M	21400	6.5	4.84	1	4.06	2
		21100	6.5	4.61	1	3.74	2
		20800	6.5	4.68	1	3.91	2
	25L	21400	6.5	4.67	1	3.81	2
		21100	6.5	4.63	1	3.79	2
		20800	6.5	4.59	1	3.80	2
	50	21400	6.5	4.93	1	4.07	2
		21100	6.5	4.55	1	3.73	2
		20800	6.5	4.58	1	3.79	2
15MHz	1H	21375	6.5	5.21	0	4.43	1
		21100	6.5	5.03	0	4.50	1
		20825	6.5	5.12	0	4.58	1
	1M	21375	6.5	5.58	0	4.94	1
		21100	6.5	5.54	0	5.11	1
		20825	6.5	5.63	0	5.13	1
	1L	21375	6.5	5.36	0	4.62	1
		21100	6.5	5.35	0	4.90	1
		20825	6.5	5.52	0	4.92	1
	36H	21375	6.5	4.87	1	4.13	2
		21100	6.5	4.51	1	3.65	2
		20825	6.5	4.58	1	3.75	2
	36M	21375	6.5	4.78	1	4.00	2
		21100	6.5	4.74	1	3.98	2
		20825	6.5	4.70	1	3.94	2
	36L	21375	6.5	4.61	1	3.82	2
		21100	6.5	4.64	1	3.78	2
		20825	6.5	4.63	1	3.84	2
	75	21375	6.5	4.81	1	4.04	2
		21100	6.5	4.59	1	3.76	2
		20825	6.5	4.59	1	3.82	2

20MHz	1H	21350	6.5	5.17	0	4.46	1
		21100	6.5	5.08	0	4.38	1
		20850	6.5	5.13	0	4.61	1
	1M	21350	6.5	5.51	0	**4.85**	1
		21100	6.5	5.50	0	**4.85**	1
		20850	6.5	5.50	0	**4.98**	1
	1L	21350	6.5	5.23	0	4.52	1
		21100	6.5	5.24	0	4.59	1
		20850	6.5	5.41	0	4.81	1
	50H	21350	6.5	4.70	1	3.96	2
		21100	6.5	4.40	1	3.55	2
		20850	6.5	4.62	1	3.86	2
	50M	21350	6.5	4.68	1	3.91	2
		21100	6.5	4.68	1	3.88	2
		20850	6.5	4.70	1	3.90	2
	50L	21350	6.5	4.44	1	3.67	2
		21100	6.5	4.73	1	3.86	2
		20850	6.5	4.58	1	3.76	2
	100	21350	6.5	4.66	1	3.89	2
		21100	6.5	4.58	1	3.76	2
		20850	6.5	4.64	1	3.80	2

The conducted power measurement results of downlink LTE CA Conduted Power are as below (Sensor OFF):

DL LTE CA Class	PCC								SCC			Power		
	PCC Band	PCC Band width (MHz)	PCC UL RB size	PCC UL RB offset	PCC DL RB size	PCC DL RB offset	PCC UL Channel	PCC DL Channel	SCC Band	SCC Band width (MHz)	SCC DL Channel	Rel 8 LTETx Power(dBm)	Rel 10 DL LTE CA Tx Power(dBm)	Tune-up
7C	7	20	1	50	100	0	20850	2850	7	20	2649.8	22.95	22.07	24
5B	5	10	1	49	50	0	20600	844	5	10	2501	23.85	23.52	25.5

Note: Testing is not required in bands or modes not intended/allowed for US operation.

The conducted power measurement results of downlink LTE CA Conduted Power are as below (Sensor ON):

DL LTE CA Class	PCC								SCC			Power		
	PCC Band	PCC Band width (MHz)	PCC UL RB size	PCC UL RB offset	PCC DL RB size	PCC DL RB offset	PCC UL Channel	PCC DL Channel	SCC Band	SCC Band width (MHz)	SCC DL Channel	Rel 8 LTETx Power(dBm)	Rel 10 DL LTE CA Tx Power(dBm)	Tune-up
7C	7	20	1	50	100	0	21350	3350	7	20	3152	5.51	4.54	6.5
5B	5	10	1	0	50	0	20450	829	5	10	2549	13.91	13.66	15.5

Note: Testing is not required in bands or modes not intended/allowed for US operation.

11.4 Wi-Fi and BT Measurement result

The output power of BT antenna is as following:

Table 11-13 Bluetooth Power

EDR			
	GFSK	EDR2M-4_DQPSK	EDR3M-8DPSK
Maximum Transmit Power(<20dBm)	5.03	3.81	3.25
tune up	9.00	9.00	9.00
BLE			
	Channel 0	Channel 19	Channel 39
Maximum Transmit Power(<20dBm)	5.68	5.04	5.23
tune up	9.00	9.00	9.00

The average conducted power for Wi-Fi is as following:

Table 11-14 WiFi 2.4G #1

WiFi 2.4G #1						
Band	Mode	Channel	Frequence	Data Rate	Tune-up	Measured
WiFi 2.4G 20M	802.11b	11	2462 MHz	5.5Mbps	9.00	8.66
		6	2437 MHz		9.00	8.71
		1	2412 MHz		9.00	7.91
		11	2462 MHz	2Mbps	/	/
		6	2437 MHz		9.00	8.63
		1	2412 MHz		/	/
		11	2462 MHz	1Mbps	9.00	8.49
		6	2437 MHz		9.00	8.60
		1	2412 MHz		9.00	7.70
		11	2462 MHz	11Mbps	/	/
		6	2437 MHz		9.00	8.64
		1	2412 MHz		/	/
	802.11g	11	2462 MHz	6Mbps	11.00	9.94
		6	2437 MHz		11.00	9.75
		1	2412 MHz		11.00	9.27
		11	2462 MHz	9Mbps	11.00	9.91
		6	2437 MHz		/	/
		1	2412 MHz		/	/
		11	2462 MHz	12Mbps	11.00	9.87
		6	2437 MHz		/	/
		1	2412 MHz		/	/
		11	2462 MHz	18Mbps	11.00	9.86
		6	2437 MHz		/	/
		1	2412 MHz		/	/
		11	2462 MHz	24Mbps	11.00	9.81
		6	2437 MHz		/	/
		1	2412 MHz		/	/
		11	2462 MHz	36Mbps	11.00	9.77
		6	2437 MHz		/	/
		1	2412 MHz		/	/
		11	2462 MHz	48Mbps	11.00	9.74
		6	2437 MHz		/	/
		1	2412 MHz		/	/
		11	2462 MHz	54Mbps	11.00	9.71
		6	2437 MHz		/	/
		1	2412 MHz		/	/
	802.11n 20M	11	2462 MHz	MCS0	10.00	8.90
		6	2437 MHz		10.00	8.66
		1	2412 MHz		10.00	8.07
		11	2462 MHz	MCS1	10.00	8.83
		6	2437 MHz		/	/
		1	2412 MHz		/	/
		11	2462 MHz	MCS2	10.00	8.82
		6	2437 MHz		/	/
		1	2412 MHz		/	/
		11	2462 MHz	MCS3	10.00	8.77
		6	2437 MHz		/	/
		1	2412 MHz		/	/
		11	2462 MHz	MCS4	10.00	8.75
		6	2437 MHz		/	/
		1	2412 MHz		/	/
		11	2462 MHz	MCS5	10.00	8.70
		6	2437 MHz		/	/
		1	2412 MHz		/	/
		11	2462 MHz	MCS6	10.00	8.68
		6	2437 MHz		/	/
		1	2412 MHz		/	/
		11	2462 MHz	MCS7	10.00	8.67
		6	2437 MHz		/	/
		1	2412 MHz		/	/

WiFi 2.4G 40M	802.11n 40M	9	2452 MHz	MCS0	8.00	7.52
		6	2437 MHz		8.00	7.09
		3	2422 MHz		8.00	7.90
		9	2452 MHz	MCS1	/	/
		6	2437 MHz		/	/
		3	2422 MHz		8.00	7.86
		9	2452 MHz	MCS2	/	/
		6	2437 MHz		/	/
		3	2422 MHz		8.00	7.49
		9	2452 MHz	MCS3	/	/
		6	2437 MHz		/	/
		3	2422 MHz		8.00	7.45
		9	2452 MHz	MCS4	/	/
		6	2437 MHz		/	/
		3	2422 MHz		8.00	7.12
		9	2452 MHz	MCS5	/	/
		6	2437 MHz		/	/
		3	2422 MHz		8.00	7.05
		9	2452 MHz	MCS6	/	/
		6	2437 MHz		/	/
		3	2422 MHz		8.00	7.04
		9	2452 MHz	MCS7	/	/
		6	2437 MHz		/	/
		3	2422 MHz		8.00	7.02

Table 11-15 WiFi UNII-1 #1

WiFi UNII-1 #1										
802.11a Measured Power (dBm)										
Channel\data rate	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	MCS8	MCS9
42(5210 MHz)	5.25	5.22	5.17	5.10	5.01	4.94	4.90	5.35	5.16	5.11
tune up	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00

Table 11-16 WiFi UNII-2A #1

WiFi UNII-2A #1										
802.11ac 80M Measured Power (dBm)										
Channel\data rate	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	MCS8	MCS9
58(5290 MHz)	4.56	4.53	4.47	4.41	4.32	4.26	4.22	4.67	4.48	4.44
tune up	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00

Table 11-17 WiFi UNII-2C #1

WiFi UNII-2C #1										
802.11ac 80M Measured Power (dBm)										
Channel\data rate	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	MCS8	MCS9
106(5530 MHz)	4.44	\	\	\	\	\	\	\	\	\
122(5610 MHz)	4.58	\	\	\	\	\	\	\	\	\
138(5690 MHz)	5.09	5.07	5.01	4.95	4.86	4.81	4.76	5.21	5.03	4.99
tune up	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00

Table 11-18 WiFi UNII-3 #1

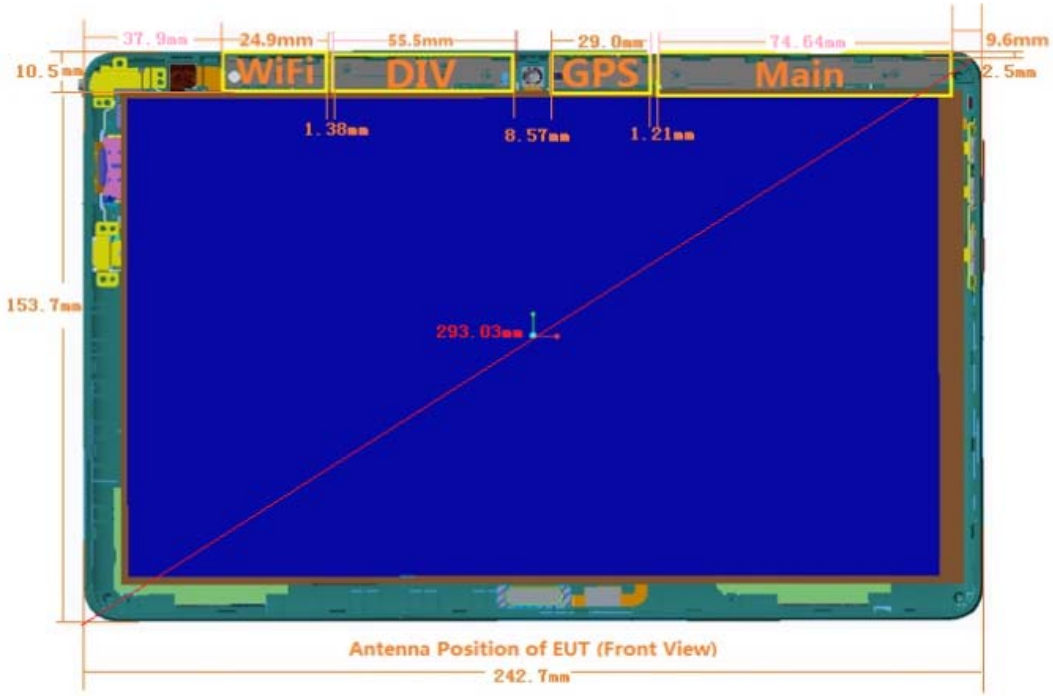
WLAN UNII-3 #1										
802.11ac 80M Measured Power (dBm)										
Channel\data rate	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	MCS8	MCS9
155(5775 MHz)	5.62	5.60	5.55	5.49	5.41	5.35	5.32	5.77	5.58	5.54
tune up	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00

12 Simultaneous TX SAR Considerations

12.1 Introduction

The following procedures adopted from “FCC SAR Considerations for Cell Phones with Multiple Transmitters” are applicable to handsets with built-in unlicensed transmitters such as 802.11 a/b/g and Bluetooth devices which may simultaneously transmit with the licensed transmitter.
For this device, the BT and Wi-Fi can transmit simultaneous with other transmitters.

12.2 Transmit Antenna Separation Distances



Picture 12.1 Antenna Locations

12.3 SAR Measurement Positions

According to the KDB941225 D06 Hot Spot SAR v02r01, the edges with less than 2.5 cm distance to the antennas need to be tested for SAR.

SAR measurement positions						
Mode	Front	Rear	Left edge	Right edge	Top edge	Bottom edge
Main antenna	No	Yes	No	Yes	Yes	No
WiFi	No	Yes	No	No	Yes	No

12.4 Standalone SAR Test Exclusion Considerations

Standalone 1-g body SAR evaluation by measurement or numerical simulation is not required when the corresponding SAR Exclusion Threshold condition, listed below, is satisfied.
The 1-g SAR test exclusion threshold for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:
[(max. power of channel, including tune-up tolerance, mW) / (min. test separation distance, mm)] · [√f(GHz)] ≤ 3.0 for 1-g SAR, where

- f(GHz) is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison

Table 12.1: Standalone SAR test exclusion considerations

Band/Mode	F(GHz)	Position	SAR test exclusion threshold (mW)	RF output power		SAR test exclusion
				dBm	mW	
Bluetooth	2.441	Body	9.6	**9**	7.94	Yes
2.4GHz WiFi 802.11 b	2.45	Body	9.58	**9**	7.94	Yes
2.4GHz WiFi 802.11 g	2.45	Body	9.58	**11**	12.59	No
WiFi 5G UNII-1	5.2	Body	6.58	**7**	5.01	Yes
WiFi 5G UNII-2A	5.3	Body	6.52	**7**	5.01	Yes
WiFi 5G UNII-2C	5.6	Body	6.34	**7**	5.01	Yes
WiFi 5G UNII-3	5.8	Body	6.23	**7**	5.01	Yes

13 Evaluation of Simultaneous

Table 13.1: The sum of reported SAR values for main antenna and WiFi

	Position	Main antenna	WiFi	Sum
Highest reported SAR value for Body 2.4G	Rear 0mm PCS1900	0.58	0.85	**1.43**
Highest reported SAR value for Body 5G	Right 0mm PCS1900	1.03	0.32	**1.35**

Table 13.2: The sum of reported SAR values for main antenna and BT

	Position	Main antenna	BT	Sum
Maximum reported SAR value for Body	Right 0mm PCS1900	1.03	0.33	**1.36**

[1] - Estimated SAR for Bluetooth (see the table 13.3)

Table 13.3: Estimated SAR for Bluetooth and WiFi

Mode/Band	F (GHz)	Position	Distance (mm)	Upper limit of power *		Estimated$_{1g}$
				dBm	mW	(W/kg)
Bluetooth	2.441	Body	5	9	7.94	0.33
WiFi 5G	5.2	Body	5	7	5.01	0.30
	5.3	Body	5	7	5.01	0.31
	5.6	Body	5	7	5.01	0.32
	5.8	Body	5	7	5.01	0.32

* - Maximum possible output power declared by manufacturer

When standalone SAR test exclusion applies to an antenna that transmits simultaneously with other antennas, the standalone SAR must be estimated according to following to determine simultaneous transmission SAR test exclusion:
(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)]·[√f(GHz)/x] W/kg for test separation distances ≤ 50 mm;
where x = 7.5 for 1-g SAR.
When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion

Conclusion:
According to the above tables, the sum of reported SAR values is<1.6W/kg. So the simultaneous transmission SAR with volume scans is not required.

14 SAR Test Result

It is determined by user manual for the distance between the EUT and the phantom bottom.The distance is 0mm and just applied to the condition of body worn accessory.
It is performed for all SAR measurements with area scan based 1-g SAR estimation (Fast SAR). A zoom scan measurement is added when the estimated 1-g SAR is the highest measured SAR in each exposure configuration, wireless mode and frequency band combination or more than 1.2W/kg.
The calculated SAR is obtained by the following formula:

$$\text{Reported SAR} = \text{Measured SAR} \times 10^{(P_{Target}-P_{Measured})/10}$$

Where P_{Target} is the power of manufacturing upper limit;

$P_{Measured}$ is the measured power in chapter 11.

14.1 SAR results

Note: The data in following "#1" tables is for Sensor OFF and the data in "#2" tables is for Sensor ON.

Table 14-1 GSM850 #1 Body

GSM850 #1 Body									
Ambient Temperature: 22.4						Liquid Temperature: 22.2			
Mode	Device orientation	SAR measurement	Measured SAR [W/kg]			Reported SAR [W/kg]			
			CH251 848.8 MHz	CH190 836.6 MHz	CH128 824.2 MHz	CH251 848.8 MHz	CH190 836.6 MHz	CH128 824.2 MHz	
GPRS 4 Txslots	Tune-up		29.50	29.50	29.50	Scaling factor*			
	Slot Average Power [dBm]		27.93	27.98	27.97	1.44	1.42	1.42	
	Rear 28mm	1g SAR		0.067			0.10		
		10g SAR		0.058			0.08		
		Deviation		-0.04			-0.04		
	Right edge 0mm	1g SAR		0.129			0.18		
		10g SAR		0.098			0.14		
		Deviation		-0.03			-0.03		
	Top edge 35mm	1g SAR		0.045			0.06		
		10g SAR		0.021			0.03		
		Deviation		-0.04			-0.04		

Table 14-2 GSM850 #2 Body

GSM850 #2 Body									
Ambient Temperature: 22.4						Liquid Temperature: 22.2			
Mode	Device orientation	SAR measurement	Measured SAR [W/kg]			Reported SAR [W/kg]			
			CH251 848.8 MHz	CH190 836.6 MHz	CH128 824.2 MHz	CH251 848.8 MHz	CH190 836.6 MHz	CH128 824.2 MHz	
GPRS 2 Txslots	Tune-up		24.50	24.50	24.50	Scaling factor*			
	Slot Average Power [dBm]		23.79	23.79	23.61	1.18	1.18	1.23	
	Rear 0mm	1g SAR	0.32	0.345	0.246	0.38	0.41	0.30	
		10g SAR	0.153	0.161	0.126	0.18	0.19	0.15	
		Deviation	0.03	-0.06	0.11	0.03	-0.06	0.11	
	Top edge 0mm	1g SAR		0.246			0.29		
		10g SAR		0.102			0.12		
		Deviation		-0.03			-0.03		
EGPRS GMSK 4 Txslots	Tune-up		21.50	21.50	21.50	Scaling factor*			
	Slot Average Power [dBm]		20.76	20.77	20.55	1.19	1.18	1.24	
	Rear 0mm	1g SAR		0.329			0.39		
		10g SAR		0.152			0.18		
		Deviation		-0.05			-0.05		

Table 14-3 PCS1900 #1 Body

PCS1900 #1 Body									
Ambient Temperature:	22.4					Liquid Temperature:	22.2		
Mode	Device orientation	SAR measurement	Measured SAR [W/kg]			Reported SAR [W/kg]			
			CH810 1909.8	CH661 1880 MHz	CH512 1850.2	CH810 1909.8	CH661 1880 MHz	CH512 1850.2	
GPRS 2 Txslots	Tune-up		29.50	29.50	29.50	Scaling factor*			
	Slot Average Power [dBm]		27.72	27.71	27.66	1.51	1.51	1.53	
	Rear 28mm	1g SAR		0.156			0.24		
		10g SAR		0.093			0.14		
		Deviation		-0.09			-0.09		
	Right edge 0mm	1g SAR	0.683	0.649	0.49	1.03	0.98	0.75	
		10g SAR	0.351	0.32	0.252	0.53	0.48	0.39	
		Deviation	-0.02	-0.06	0.011	-0.02	-0.06	0.01	
	Top edge 35mm	1g SAR		0.103			0.16		
		10g SAR		0.064			0.10		
		Deviation		-0.04			-0.04		
EGPRS GMSK 2 Txslots	Tune-up		29.50	29.50	29.50	Scaling factor*			
	Slot Average Power [dBm]		27.76	27.67	27.62	1.49	1.52	1.54	
	Right edge 0mm	1g SAR	0.655			0.98			
		10g SAR	0.342			0.51			
		Deviation	-0.07			-0.07			

Table 14-4 PCS1900 #2 Body

PCS1900 #2 Body									
Ambient Temperature:	22.4					Liquid Temperature:	22.2		
Mode	Device orientation	SAR measurement	Measured SAR [W/kg]			Reported SAR [W/kg]			
			CH810 1909.8	CH661 1880 MHz	CH512 1850.2	CH810 1909.8	CH661 1880 MHz	CH512 1850.2	
GPRS 2 Txslots	Tune-up		17.00	17.00	17.00	Scaling factor*			
	Slot Average Power [dBm]		15.57	15.48	15.48	1.39	1.42	1.42	
	Rear 0mm	1g SAR		0.41			0.58		
		10g SAR		0.175			0.25		
		Deviation		0.08			0.08		
	Top edge 0mm	1g SAR		0.346			0.49		
		10g SAR		0.132			0.19		
		Deviation		0.09			0.09		

Table 14-5 WCDMA1900-BII #1Body

WCDMA1900-BII #1Body									
Ambient Temperature:	22.4					Liquid Temperature:	22.2		
Mode	Device orientation	SAR measurement	Measured SAR [W/kg]			Reported SAR [W/kg]			
			CH9538 1907.6 MHz	CH9400 1880 MHz	CH9262 1852.4 MHz	CH9538 1907.6 MHz	CH9400 1880 MHz	CH9262 1852.4 MHz	
RMC	Tune-up		23.00	23.00	23.00	Scaling factor*			
	Slot Average Power [dBm]		21.58	21.62	21.61	1.39	1.37	1.38	
	Rear 28mm	1g SAR		0.141			0.19		
		10g SAR		0.089			0.12		
		Deviation		-0.05			-0.05		
	Right edge 0mm	1g SAR	0.513	0.491	0.553	0.71	0.67	0.76	
		10g SAR	0.268	0.268	0.294	0.37	0.37	0.40	
		Deviation	-0.05	-0.05	-0.01	-0.05	-0.05	-0.01	
	Top edge 35mm	1g SAR		0.051			0.07		
		10g SAR		0.033			0.05		
		Deviation		-0.02			-0.02		

Table 14-6 WCDMA1900-BII #2Body

WCDMA1900-BII #2Body								
Ambient Temperature:	22.4					Liquid Temperature:		22.2
Mode	Device orientation	SAR measurement	Measured SAR [W/kg]			Reported SAR [W/kg]		
			CH9538 1907.6 MHz	CH9400 1880 MHz	CH9262 1852.4 MHz	CH9538 1907.6 MHz	CH9400 1880 MHz	CH9262 1852.4 MHz
RMC	Tune-up		7.50	7.50	7.50	Scaling factor*		
	Slot Average Power [dBm]		5.84	5.98	5.66	1.47	1.42	1.53
	Rear 0mm	1g SAR		0.221			0.31	
		10g SAR		0.092			0.13	
		Deviation		0.13			0.13	
	Top edge 0mm	1g SAR		0.118			0.17	
		10g SAR		0.052			0.07	
		Deviation		-0.07			-0.07	

Table 14-7 WCDMA850-BV #1Body

WCDMA850-BV #1Body								
Ambient Temperature:	22.4					Liquid Temperature:		22.2
Mode	Device orientation	SAR measurement	Measured SAR [W/kg]			Reported SAR [W/kg]		
			CH4233 846.6 MHz	CH4183 836.6 MHz	CH4132 826.4 MHz	CH4233 846.6 MHz	CH4183 836.6 MHz	CH4132 826.4 MHz
RMC	Tune-up		25.50	25.50	25.50	Scaling factor*		
	Slot Average Power [dBm]		23.75	23.73	23.67	1.50	1.50	1.52
	Rear 28mm	1g SAR		0.059			0.09	
		10g SAR		0.054			0.08	
		Deviation		-0.08			-0.08	
	Right edge 0mm	1g SAR		0.094			0.14	
		10g SAR		0.074			0.11	
		Deviation		-0.03			-0.03	
	Top edge 35mm	1g SAR		<0.01			<0.01	
		10g SAR		<0.01			<0.01	
		Deviation		0.06			0.06	

Table 14-8 WCDMA850-BV #2Body

WCDMA850-BV #2Body								
Ambient Temperature:	22.4					Liquid Temperature:		22.2
Mode	Device orientation	SAR measurement	Measured SAR [W/kg]			Reported SAR [W/kg]		
			CH4233 846.6 MHz	CH4183 836.6 MHz	CH4132 826.4 MHz	CH4233 846.6 MHz	CH4183 836.6 MHz	CH4132 826.4 MHz
RMC	Tune-up		16.00	16.00	16.00	Scaling factor*		
	Slot Average Power [dBm]		14.47	14.44	14.65	1.42	1.43	1.36
	Rear 0mm	1g SAR	0.301	0.226	0.211	0.43	0.32	0.29
		10g SAR	0.15	0.128	0.105	0.21	0.18	0.14
		Deviation	-0.09	-0.08	-0.01	-0.09	-0.08	-0.01
	Top edge 0mm	1g SAR		0.116			0.17	
		10g SAR		0.064			0.09	
		Deviation		0.08			0.08	

Table 14-9 LTE850-FDD5 #1 Body

LTE850-FDD5 #1 Body									
Ambient Temperature:	22.4					Liquid Temperature:	22.2		
Mode	Device orientation	SAR measurement	Measured SAR [W/kg]			Reported SAR [W/kg]			
			20600	20525	20450	20600	20525	20450	
			H	L	L	H	L	L	
10MHz QPSK1RB	Tune-up		25.50	25.50	25.50	Scaling factor*			
	Measured Power [dBm]		23.85	23.83	23.81	1.46	1.47	1.48	
	Rear 28mm	1g SAR	0.059			0.09			
		10g SAR	0.044			0.06			
		Deviation	-0.08			-0.08			
	Right edge 0mm	1g SAR	0.109			0.16			
		10g SAR	0.069			0.10			
		Deviation	0.03			0.03			
	Top edge 35mm	1g SAR	<0.01			<0.01			
		10g SAR	<0.01			<0.01			
		Deviation	-0.08			-0.08			
Mode	Device orientation	SAR measurement	Measured SAR [W/kg]			Reported SAR [W/kg]			
			20600	20525	20450	20600	20525	20450	
			M	M	M				
10MHz QPSK50% RB	Tune-up		24.50	24.50	24.50	Scaling factor*			
	Measured Power [dBm]		23.09	22.98	23.11	1.38	1.42	1.38	
	Rear 28mm	1g SAR			<0.01			<0.01	
		10g SAR			<0.01			<0.01	
		Deviation			-0.05			-0.05	
	Right edge 0mm	1g SAR			0.072			0.10	
		10g SAR			0.045			0.06	
		Deviation			0.05			0.05	
	Top edge 35mm	1g SAR			<0.01			<0.01	
		10g SAR			<0.01			<0.01	
		Deviation			0.08			0.08	

Table 14-10 LTE850-FDD5 #2 Body

LTE850-FDD5 #2 Body									
Ambient Temperature:	22.4					Liquid Temperature:	22.2		
Mode	Device orientation	SAR measurement	Measured SAR [W/kg]			Reported SAR [W/kg]			
			20600	20525	20450	20600	20525	20450	
			M	L	L	M	L	L	
10MHz QPSK1RB	Tune-up		15.50	15.50	15.50	Scaling factor*			
	Measured Power [dBm]		13.88	13.78	13.91	1.45	1.49	1.44	
	Rear 0mm	1g SAR			0.192			0.28	
		10g SAR			0.079			0.11	
		Deviation			-0.05			-0.05	
	Top edge 0mm	1g SAR			0.137			0.20	
		10g SAR			0.052			0.08	
		Deviation			-0.08			-0.08	
Mode	Device orientation	SAR measurement	Measured SAR [W/kg]			Reported SAR [W/kg]			
			20600	20525	20450	20600	20525	20450	
			M	M	M				
10MHz QPSK50% RB	Tune-up		14.50	14.50	14.50	Scaling factor*			
	Measured Power [dBm]		13.14	13.12	13.23	1.37	1.37	1.34	
	Rear 0mm	1g SAR			0.183			0.24	
		10g SAR			0.076			0.10	
		Deviation			0.13			0.13	
	Top edge 0mm	1g SAR			0.114			0.15	
		10g SAR			0.045			0.06	
		Deviation			-0.07			-0.07	

Table 14-11 LTE2500-FDD7 #1 Body

LTE2500-FDD7 #1 Body									
Ambient Temperature:	22.4					Liquid Temperature:	22.2		
Mode	Device orientation	SAR measurement	Measured SAR [W/kg]			Reported SAR [W/kg]			
			21350	21100	20850	21350	21100	20850	
			M	L	M	M	L	M	
20MHz QPSK1RB	Tune-up		24.00	24.00	24.00	Scaling factor*			
	Measured Power [dBm]		22.85	22.70	22.95	1.30	1.35	1.27	
	Rear 28mm	1g SAR			0.307			0.39	
		10g SAR			0.174			0.22	
		Deviation			0.08			0.08	
	Right edge 0mm	1g SAR	0.702	0.681	0.784	0.91	0.92	1.00	
		10g SAR	0.308	0.298	0.335	0.40	0.40	0.43	
		Deviation	0.09	-0.01	-0.01	0.09	-0.01	-0.01	
	Top edge 35mm	1g SAR	0.539	0.467	0.65	0.70	0.63	0.83	
		10g SAR	0.308	0.268	0.379	0.40	0.36	0.48	
		Deviation	-0.01	0.07	-0.08	-0.01	0.07	-0.08	
Mode	Device orientation	SAR measurement	Measured SAR [W/kg]			Reported SAR [W/kg]			
			21350	21100	20850	21350	21100	20850	
			M	L	H				
20MHz QPSK50% RB	Tune-up		23.00	23.00	23.00	Scaling factor*			
	Measured Power [dBm]		22.15	22.11	22.19	1.22	1.23	1.21	
	Rear 28mm	1g SAR			0.281			0.34	
		10g SAR			0.159			0.19	
		Deviation			-0.08			-0.08	
	Right edge 0mm	1g SAR	0.607	0.573	0.742	0.74	0.70	0.89	
		10g SAR	0.267	0.252	0.316	0.32	0.31	0.38	
		Deviation	0.11	0.09	-0.05	0.11	0.09	-0.05	
	Top edge 35mm	1g SAR			0.587			0.71	
		10g SAR			0.342			0.41	
		Deviation			0.08			0.08	
Mode	Device orientation	SAR measurement	Measured SAR [W/kg]			Reported SAR [W/kg]			
			21350	21100	20850	21350	21100	20850	
20MHz QPSK100% RB	Tune-up		23.00	23.00	23.00	Scaling factor*			
	Measured Power [dBm]		22.18	21.93	22.14	1.21	1.28	1.22	
	Right edge 0mm	1g SAR	0.616			0.74			
		10g SAR	0.269			0.32			
		Deviation	0.08			0.08			

Table 14-12 LTE2500-FDD7 #2 Body

LTE2500-FDD7 #2 Body								
Ambient Temperature:	22.4					Liquid Temperature:		22.2
Mode	Device orientation	SAR measurement	Measured SAR [W/kg]			Reported SAR [W/kg]		
			21350	21100	20850	21350	21100	20850
			M	M	M	M	M	M
20MHz QPSK1RB	Tune-up		6.50	6.50	6.50	Scaling factor*		
	Measured Power [dBm]		5.51	5.50	5.50	1.26	1.26	1.26
	Rear 0mm	1g SAR	0.324			0.41		
		10g SAR	0.111			0.14		
		Deviation	-0.05			-0.05		
	Top edge 0mm	1g SAR	0.349			0.44		
		10g SAR	0.128			0.16		
		Deviation	0.02			0.02		
Mode	Device orientation	SAR measurement	Measured SAR [W/kg]			Reported SAR [W/kg]		
			21350	21100	20850	21350	21100	20850
			H	L	M			
20MHz QPSK50% RB	Tune-up		5.50	5.50	5.50	Scaling factor*		
	Measured Power [dBm]		4.70	4.73	4.70	1.20	1.19	1.20
	Rear 0mm	1g SAR		0.263			0.31	
		10g SAR		0.099			0.12	
		Deviation		-0.08			-0.08	
	Top edge 0mm	1g SAR		0.365			0.44	
		10g SAR		0.121			0.14	
		Deviation		0.14			0.14	

14.2 Full SAR

Test Band	Channel	Frequency	Tune-Up	Measured Power	Test Position	Measured 10g SAR	Measured 1g SAR	Reported 10g SAR	Reported 1g SAR	Power Drift	Figure
GSM850	190	836.6 MHz	24.5	23.79	Rear 0mm	0.161	0.345	0.19	0.41	-0.06	Fig A.1
PCS1900	810	1909.8 MHz	29.5	27.72	Right edge 0mm	0.351	0.683	0.53	1.03	-0.02	Fig A.2
WCDMA1900-BII	9400	1880 MHz	23	21.62	Right edge 0mm	0.294	0.553	0.40	0.76	-0.01	Fig A.3
WCDMA850-BV	4233	846.6 MHz	16	14.47	Rear 0mm	0.15	0.301	0.21	0.43	-0.09	Fig A.4
LTE850-FDD5	20450	829 MHz	15.5	13.91	Rear 0mm	0.079	0.192	0.11	0.28	-0.05	Fig A.5
LTE2500-FDD7	20850	2510 MHz	24	22.95	Right edge 0mm	0.335	0.784	0.43	1.00	-0.01	Fig A.6

14.3 WLAN Evaluation

According to the KDB248227 D01, SAR is measured for 802.11b DSSS using the initial test position procedure.

Note1: When the reported SAR of the initial test position is > 0.4 W/kg, SAR is repeated for the 802.11 transmission mode configuration tested in the initial test position using subsequent highest estimated 1-g SAR conditions determined by area scans, on the highest maximum output power channel, until the reported SAR is ≤ 0.8 W/kg.

Note2: For all positions/configurations tested using the initial test position and subsequent test positions, 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 until the reported SAR is ≤ 1.2 W/kg or all required channels are tested.

Note3: According to the KDB248227 D01, The reported SAR must be scaled to 100% transmission duty factor to determine compliance at the maximum tune-up tolerance limit.

Table 14-13 WLAN2450 #1 Body Fast SAR

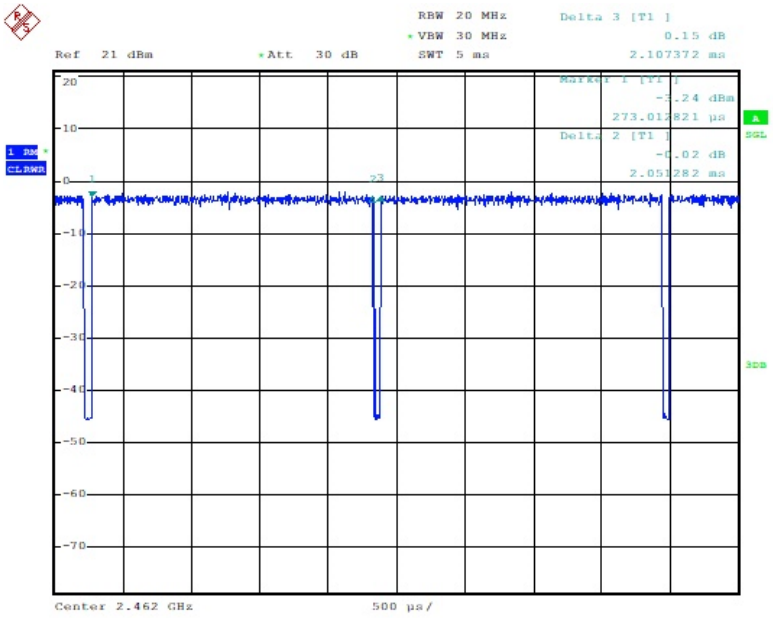
WiFi 2.4G #1 Body Fast SAR									
Ambient Temperature:	22.4					Liquid Temperature:	22.2		
Rate	Device orientation	SAR measurement	Measured SAR [W/kg]			Reported SAR [W/kg]			
			11	6	1	11	6	1	
			2462 MHz	2437 MHz	2412 MHz				
802.11g 6Mbps	Tune up		11	11	11	Scaling factor*			
	Slot Average Power [dBm]		9.94	9.75	9.27	1.28	1.33	1.49	
	Rear 0mm	1g Fast SAR	0.594	0.514		0.76	0.69		
		10g SAR	0.241	0.207		0.31	0.28		
		Deviation	0.01	0.04		0.01	0.04		
	Top edge 0mm	1g Fast SAR	0.169			0.22			
		10g SAR	0.077			0.10			
		Deviation	0.03			0.03			

Table 14-14 WLAN2450 #1 Body Full SAR

WiFi 2.4G #1 Body Full SAR									
Ambient Temperature:	22.4					Liquid Temperature:	22.2		
Rate	Device orientation	SAR measurement	Measured SAR [W/kg]			Reported SAR [W/kg]			
			11	6	1	11	6	1	
			2462 MHz	2437 MHz	2412 MHz				
802.11g 6Mbps	Tune up		11	11	11	Scaling factor*			
	Slot Average Power [dBm]		9.94	9.75	9.27	1.28	1.33	1.49	
	Rear 0mm	1g Full SAR	0.65	0.561		0.83	0.75		
		10g SAR	0.245	0.209		0.31	0.28		
		Deviation	0.01	0.04		0.01	0.04		
	Top edge 0mm	1g Full SAR	0.203			0.26			
		10g SAR	0.085			0.11			
		Deviation	0.03			0.03			

According to the KDB248227 D01, The reported SAR must be scaled to 100% transmission duty factor to determine compliance at the maximum tune-up tolerance limit. The scaled reported SAR is presented as below

Frequency		Test Position	Actual duty factor	maximum duty factor	Reported SAR(1g)(W/kg)	Scaled reported SAR(1g)(W/kg)	Figure
MHz	Ch.						
2462	11	Rear	97.30%	100%	**0.83**	**0.85**	Fig.A.7



Picture 14.1 Duty factor plot CH6

15 SAR Measurement Variability

SAR measurement variability must be assessed for each frequency band, which is determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. When both body tissue-equivalent media is required for SAR measurements in a frequency band, the variability measurement procedures should be applied to the tissue medium with the highest measured SAR, using the highest measured SAR configuration for that tissue-equivalent medium. The following procedures are applied to determine if repeated measurements are required.

1) Repeated measurement is not required when the original highest measured SAR is < 0.80 W/kg; steps 2) through 4) do not apply.

2) When the original highest measured SAR is ≥ 0.80 W/kg, repeat that measurement once.

3) Perform a second repeated measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is > 1.20 or when the original or repeated measurement is ≥ 1.45 W/kg (~ 10% from the 1-g SAR limit).

4) Perform a third repeated measurement only if the original, first or second repeated measurement is ≥ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.

16 Measurement Uncertainty

16.1 Measurement Uncertainty for Normal SAR Tests (300MHz~3GHz)

No.	Error Description	Type	Uncertainty value	Probably Distribution	Div.	(Ci) 1g	(Ci) 10g	Std. Unc. (1g)	Std. Unc. (10g)	Degree of freedom
Measurement system										
1	Probe calibration	B	6.0	N	1	1	1	6.0	6.0	∞
2	Isotropy	B	4.7	R	$\sqrt{3}$	0.7	0.7	1.9	1.9	∞
3	Boundary effect	B	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	∞
4	Linearity	B	4.7	R	$\sqrt{3}$	1	1	2.7	2.7	∞
5	Detection limit	B	1.0	N	1	1	1	0.6	0.6	∞
6	Readout electronics	B	0.3	R	$\sqrt{3}$	1	1	0.3	0.3	∞
7	Response time	B	0.8	R	$\sqrt{3}$	1	1	0.5	0.5	∞
8	Integration time	B	2.6	R	$\sqrt{3}$	1	1	1.5	1.5	∞
9	RF ambient conditions-noise	B	0	R	$\sqrt{3}$	1	1	0	0	∞
10	RFambient conditions-reflection	B	0	R	$\sqrt{3}$	1	1	0	0	∞
11	Probe positioned mech. restrictions	B	0.4	R	$\sqrt{3}$	1	1	0.2	0.2	∞
12	Probe positioning with respect to phantom shell	B	2.9	R	$\sqrt{3}$	1	1	1.7	1.7	∞
13	Post-processing	B	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	∞
Test sample related										
14	Test sample positioning	A	3.3	N	1	1	1	3.3	3.3	71
15	Device holder uncertainty	A	3.4	N	1	1	1	3.4	3.4	5
16	Drift of output power	B	5.0	R	$\sqrt{3}$	1	1	2.9	2.9	∞
Phantom and set-up										
17	Phantom uncertainty	B	4.0	R	$\sqrt{3}$	1	1	2.3	2.3	∞
18	Liquid conductivity (target)	B	5.0	R	$\sqrt{3}$	0.64	0.43	1.8	1.2	∞
19	Liquid conductivity (meas.)	A	2.06	N	1	0.64	0.43	1.32	0.89	43
20	Liquid permittivity (target)	B	5.0	R	$\sqrt{3}$	0.6	0.49	1.7	1.4	∞
21	Liquid permittivity (meas.)	A	1.6	N	1	0.6	0.49	1.0	0.8	521

Combined standard uncertainty	$u_c' = \sqrt{\sum_{i=1}^{21} c_i^2 u_i^2}$					9.55	9.43	257
Expanded uncertainty (confidence interval of 95 %)	$u_e = 2u_c$					19.1	18.9	

16.2 Measurement Uncertainty for Normal SAR Tests (3~6GHz)

No.	Error Description	Type	Uncertainty value	Probably Distribution	Div.	(Ci) 1g	(Ci) 10g	Std. Unc. (1g)	Std. Unc. (10g)	Degree of freedom
Measurement system										
1	Probe calibration	B	6.55	N	1	1	1	6.55	6.55	∞
2	Isotropy	B	4.7	R	$\sqrt{3}$	0.7	0.7	1.9	1.9	∞
3	Boundary effect	B	2.0	R	$\sqrt{3}$	1	1	1.2	1.2	∞
4	Linearity	B	4.7	R	$\sqrt{3}$	1	1	2.7	2.7	∞
5	Detection limit	B	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	∞
6	Readout electronics	B	0.3	R	$\sqrt{3}$	1	1	0.3	0.3	∞
7	Response time	B	0.8	R	$\sqrt{3}$	1	1	0.5	0.5	∞
8	Integration time	B	2.6	R	$\sqrt{3}$	1	1	1.5	1.5	∞
9	RF ambient conditions-noise	B	0	R	$\sqrt{3}$	1	1	0	0	∞
10	RF ambient conditions-reflection	B	0	R	$\sqrt{3}$	1	1	0	0	∞
11	Probe positioned mech. restrictions	B	0.8	R	$\sqrt{3}$	1	1	0.5	0.5	∞
12	Probe positioning with respect to phantom shell	B	6.7	R	$\sqrt{3}$	1	1	3.9	3.9	∞
13	Post-processing	B	4.0	R	$\sqrt{3}$	1	1	2.3	2.3	∞
Test sample related										
14	Test sample positioning	A	3.3	N	1	1	1	3.3	3.3	71
15	Device holder uncertainty	A	3.4	N	1	1	1	3.4	3.4	5
16	Drift of output power	B	5.0	R	$\sqrt{3}$	1	1	2.9	2.9	∞
Phantom and set-up										
17	Phantom uncertainty	B	4.0	R	$\sqrt{3}$	1	1	2.3	2.3	∞
18	Liquid conductivity (target)	B	5.0	R	$\sqrt{3}$	0.64	0.43	1.8	1.2	∞
19	Liquid conductivity (meas.)	A	2.06	N	1	0.64	0.43	1.32	0.89	43
20	Liquid permittivity	B	5.0	R	$\sqrt{3}$	0.6	0.49	1.7	1.4	∞

	(target)									
21	Liquid permittivity (meas.)	A	1.6	N	1	0.6	0.49	1.0	0.8	521
Combined standard uncertainty		$u_c' = \sqrt{\sum_{i=1}^{21} c_i^2 u_i^2}$						10.7	10.6	257
Expanded uncertainty (confidence interval of 95 %)		$u_e = 2u_c$						21.4	21.1	

16.3 Measurement Uncertainty for Fast SAR Tests (300MHz~3GHz)

No.	Error Description	Type	Uncertainty value	Probably Distribution	Div.	(Ci) 1g	(Ci) 10g	Std. Unc. (1g)	Std. Unc. (10g)	Degree of freedom
Measurement system										
1	Probe calibration	B	6.0	N	1	1	1	6.0	6.0	∞
2	Isotropy	B	4.7	R	$\sqrt{3}$	0.7	0.7	1.9	1.9	∞
3	Boundary effect	B	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	∞
4	Linearity	B	4.7	R	$\sqrt{3}$	1	1	2.7	2.7	∞
5	Detection limit	B	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	∞
6	Readout electronics	B	0.3	R	$\sqrt{3}$	1	1	0.3	0.3	∞
7	Response time	B	0.8	R	$\sqrt{3}$	1	1	0.5	0.5	∞
8	Integration time	B	2.6	R	$\sqrt{3}$	1	1	1.5	1.5	∞
9	RF ambient conditions-noise	B	0	R	$\sqrt{3}$	1	1	0	0	∞
10	RF ambient conditions-reflection	B	0	R	$\sqrt{3}$	1	1	0	0	∞
11	Probe positioned mech. Restrictions	B	0.4	R	$\sqrt{3}$	1	1	0.2	0.2	∞
12	Probe positioning with respect to phantom shell	B	2.9	R	$\sqrt{3}$	1	1	1.7	1.7	∞
13	Post-processing	B	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	∞
14	Fast SAR z-Approximation	B	7.0	R	$\sqrt{3}$	1	1	4.0	4.0	∞
Test sample related										
15	Test sample positioning	A	3.3	N	1	1	1	3.3	3.3	71
16	Device holder uncertainty	A	3.4	N	1	1	1	3.4	3.4	5
17	Drift of output power	B	5.0	R	$\sqrt{3}$	1	1	2.9	2.9	∞
Phantom and set-up										
18	Phantom uncertainty	B	4.0	R	$\sqrt{3}$	1	1	2.3	2.3	∞

19	Liquid conductivity (target)	B	5.0	R	$\sqrt{3}$	0.64	0.43	1.8	1.2	∞
20	Liquid conductivity (meas.)	A	2.06	N	1	0.64	0.43	1.32	0.89	43
21	Liquid permittivity (target)	B	5.0	R	$\sqrt{3}$	0.6	0.49	1.7	1.4	∞
22	Liquid permittivity (meas.)	A	1.6	N	1	0.6	0.49	1.0	0.8	521
Combined standard uncertainty		$u_c' = \sqrt{\sum_{i=1}^{22} c_i^2 u_i^2}$						10.4	10.3	257
Expanded uncertainty (confidence interval of 95 %)		$u_e = 2u_c$						20.8	20.6	

16.4 Measurement Uncertainty for Fast SAR Tests (3~6GHz)

No.	Error Description	Type	Uncertainty value	Probably Distribution	Div.	(Ci) 1g	(Ci) 10g	Std. Unc. (1g)	Std. Unc. (10g)	Degree of freedom
Measurement system										
1	Probe calibration	B	6.55	N	1	1	1	6.55	6.55	∞
2	Isotropy	B	4.7	R	$\sqrt{3}$	0.7	0.7	1.9	1.9	∞
3	Boundary effect	B	2.0	R	$\sqrt{3}$	1	1	1.2	1.2	∞
4	Linearity	B	4.7	R	$\sqrt{3}$	1	1	2.7	2.7	∞
5	Detection limit	B	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	∞
6	Readout electronics	B	0.3	R	$\sqrt{3}$	1	1	0.3	0.3	∞
7	Response time	B	0.8	R	$\sqrt{3}$	1	1	0.5	0.5	∞
8	Integration time	B	2.6	R	$\sqrt{3}$	1	1	1.5	1.5	∞
9	RF ambient conditions-noise	B	0	R	$\sqrt{3}$	1	1	0	0	∞
10	RF ambient conditions-reflection	B	0	R	$\sqrt{3}$	1	1	0	0	∞
11	Probe positioned mech. Restrictions	B	0.8	R	$\sqrt{3}$	1	1	0.5	0.5	∞
12	Probe positioning with respect to phantom shell	B	6.7	R	$\sqrt{3}$	1	1	3.9	3.9	∞
13	Post-processing	B	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	∞
14	Fast SAR z-Approximation	B	14.0	R	$\sqrt{3}$	1	1	8.1	8.1	∞
Test sample related										
15	Test sample positioning	A	3.3	N	1	1	1	3.3	3.3	71

16	Device holder uncertainty	A	3.4	N	1	1	1	3.4	3.4	5
17	Drift of output power	B	5.0	R	$\sqrt{3}$	1	1	2.9	2.9	∞
Phantom and set-up										
18	Phantom uncertainty	B	4.0	R	$\sqrt{3}$	1	1	2.3	2.3	∞
19	Liquid conductivity (target)	B	5.0	R	$\sqrt{3}$	0.64	0.43	1.8	1.2	∞
20	Liquid conductivity (meas.)	A	2.06	N	1	0.64	0.43	1.32	0.89	43
21	Liquid permittivity (target)	B	5.0	R	$\sqrt{3}$	0.6	0.49	1.7	1.4	∞
22	Liquid permittivity (meas.)	A	1.6	N	1	0.6	0.49	1.0	0.8	521
Combined standard uncertainty		$u_c' = \sqrt{\sum_{i=1}^{22} c_i^2 u_i^2}$						13.5	13.4	257
Expanded uncertainty (confidence interval of 95 %)		$u_e = 2u_c$						27.0	26.8	

17 MAIN TEST INSTRUMENTS

Table 17.1: List of Main Instruments

No.	Name	Type	Serial Number	Calibration Date	Valid Period
01	Network analyzer	E5071C	MY55491241	June 15, 2018	One year
02	Power meter	NRP2	101919	June 20, 2018	One year
03	Power sensor	NRP-Z91	101547		
04	Signal Generator	E4438C	MY49070393	January 4,2019	One Year
05	Amplifier	60S1G4	0331848	No Calibration Requested	
06	BTS	CMW500	159890	January 3, 2019	One year
07	E-field Probe	SPEAG EX3DV4	7514	August 27,2018	One year
08	DAE	SPEAG DAE4	1525	September 18, 2018	One year
09	Dipole Validation Kit	SPEAG D835V2	4d069	July 19, 2017	Two years
10	Dipole Validation Kit	SPEAG D1900V2	5d101	July 26, 2017	Two years
11	Dipole Validation Kit	SPEAG D1750V2	1003	July 21, 2017	Two years
12	Dipole Validation Kit	SPEAG D2600V2	1012	July 21, 2017	Two years
13	Dipole Validation Kit	SPEAG D2450V2	853	July 21, 2017	Two years

END OF REPORT BODY

ANNEX A Graph Results

GSM850_CH190 Rear 0mm
Date: 4/14/2019
Electronics: DAE4 Sn1525
Medium: body 835 MHz
Medium parameters used: f = 836.6 MHz; σ = 0.984 mho/m; εr = 55.97; ρ = 1000 kg/m^3
Ambient Temperature: 22.4ºC, Liquid Temperature: 22.2ºC
Communication System: GSM850 836.6 MHz Duty Cycle: 1:4
Probe: EX3DV4 – SN7514 ConvF(9.47,9.47,9.47)

Area Scan (71x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.64 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 5.043 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 0.985 W/kg
SAR(1 g) = 0.345 W/kg; SAR(10 g) = 0.161 W/kg
Maximum value of SAR (measured) = 0.583 W/kg

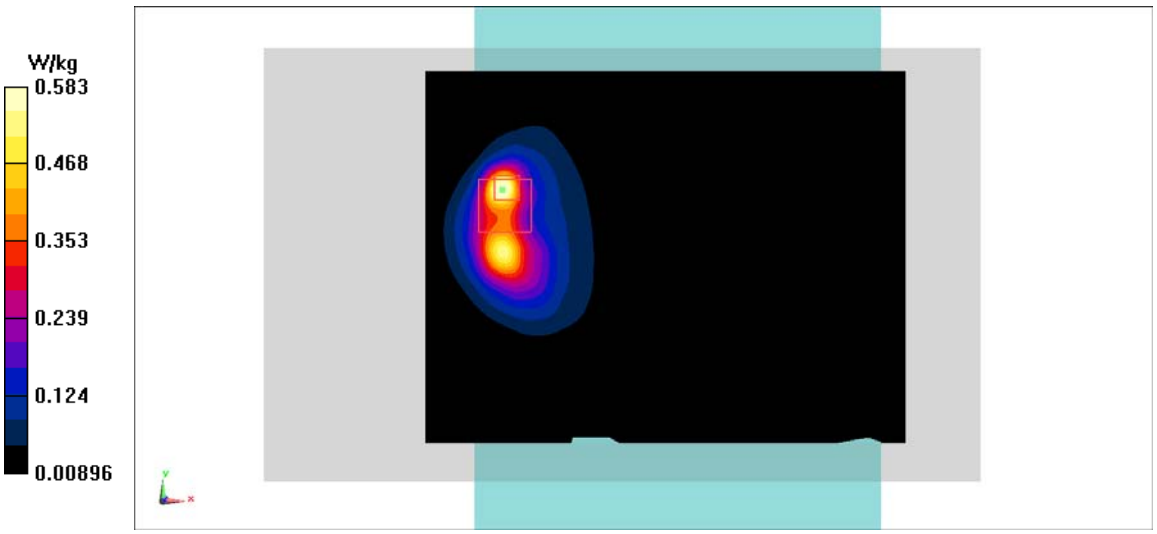


Fig A.1

PCS1900_CH810 Right edge 0mm
Date: 4/15/2019
Electronics: DAE4 Sn1525
Medium: body 1900 MHz
Medium parameters used: f = 1909.8 MHz; σ = 1.518 mho/m; εr = 52.72; ρ = 1000 kg/m^3
Ambient Temperature: 22.4ºC, Liquid Temperature: 22.2ºC
Communication System: PCS1900 1909.8 MHz Duty Cycle: 1:4
Probe: EX3DV4 – SN7514 ConvF(7.53,7.53,7.53)

Area Scan (71x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.818 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 19.99 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 1.37 W/kg
SAR(1 g) = 0.683 W/kg; SAR(10 g) = 0.351 W/kg
Maximum value of SAR (measured) = 1.06 W/kg

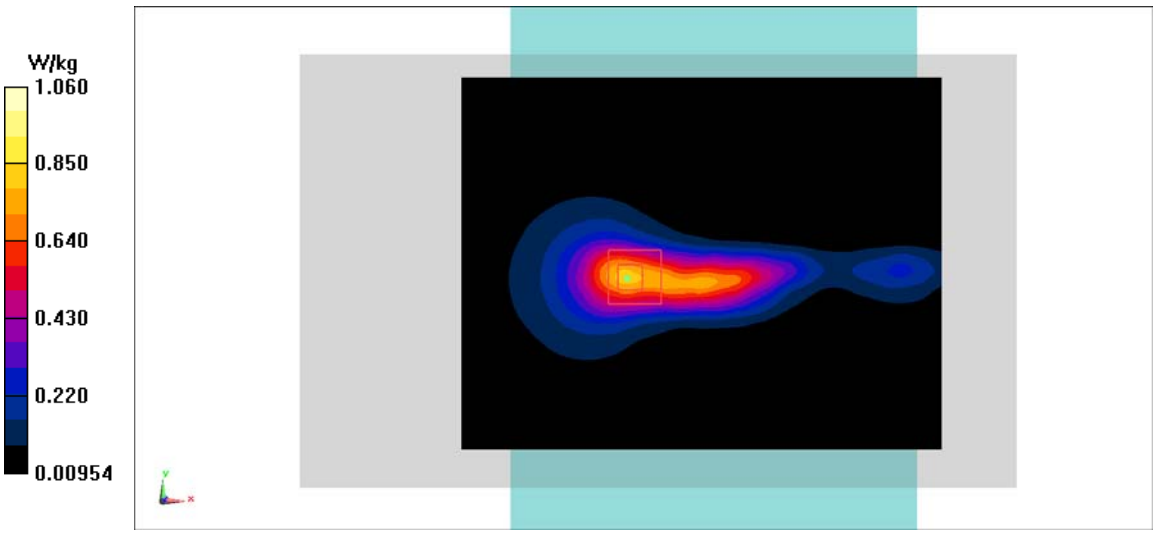


Fig A.2

WCDMA1900-BII_CH9400 Right edge 0mm
Date: 4/15/2019
Electronics: DAE4 Sn1525
Medium: body 1900 MHz
Medium parameters used: f = 1880 MHz; σ = 1.489 mho/m; εr = 52.75; ρ = 1000 kg/m^3
Ambient Temperature: 22.4ºC, Liquid Temperature: 22.2ºC
Communication System: WCDMA1900-BII 1880 MHz Duty Cycle: 1:1
Probe: EX3DV4 – SN7514 ConvF(7.53,7.53,7.53)

Area Scan (71x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.758 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 12.78 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 1.04 W/kg
SAR(1 g) = 0.553 W/kg; SAR(10 g) = 0.294 W/kg
Maximum value of SAR (measured) = 0.798 W/kg

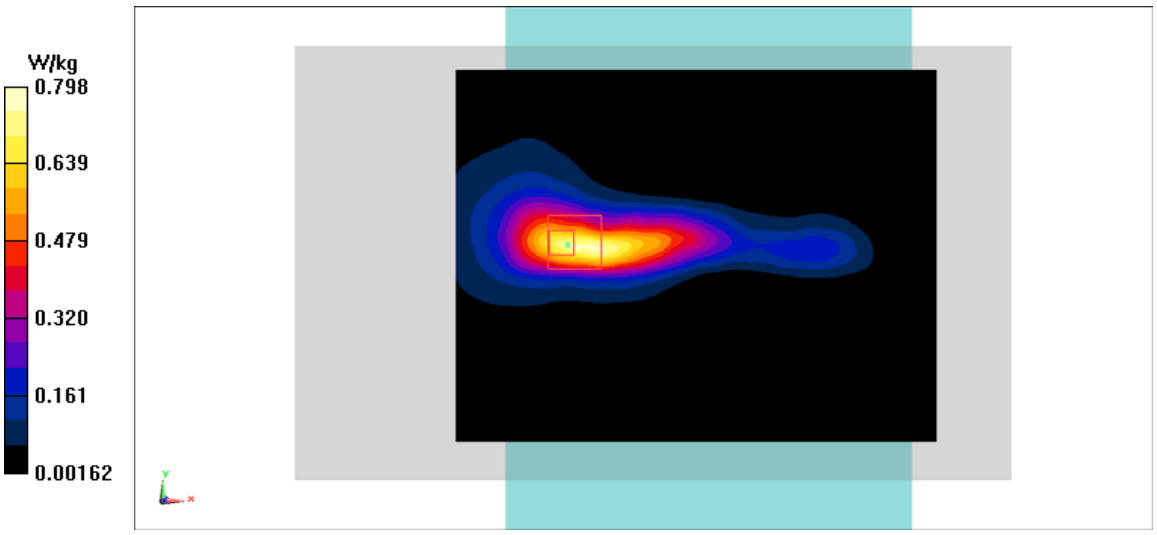


Fig A.3

WCDMA850-BV_CH4233 Rear 0mm
Date: 4/14/2019
Electronics: DAE4 Sn1525
Medium: body 835 MHz
Medium parameters used: f = 846.6 MHz; σ = 0.993 mho/m; εr = 55.96; ρ = 1000 kg/m^3
Ambient Temperature: 22.4ºC, Liquid Temperature: 22.2ºC
Communication System: WCDMA850-BV 846.6 MHz Duty Cycle: 1:1
Probe: EX3DV4 – SN7514 ConvF(9.47,9.47,9.47)

Area Scan (71x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.591 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 4.024 V/m; Power Drift = -0.09 dB
Peak SAR (extrapolated) = 1.11 W/kg
SAR(1 g) = 0.301 W/kg; SAR(10 g) = 0.15 W/kg
Maximum value of SAR (measured) = 0.595 W/kg

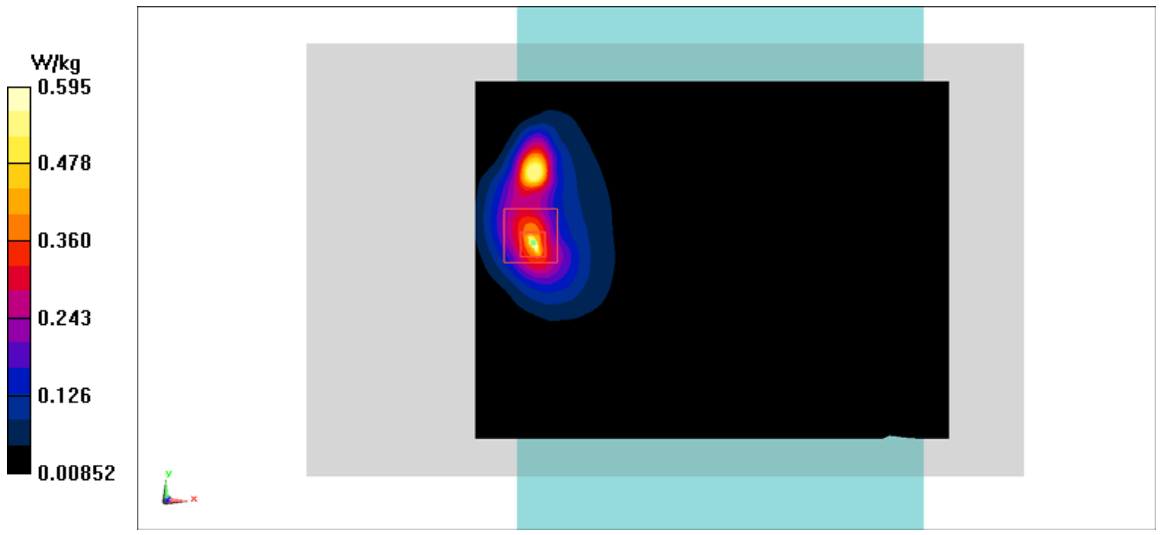


Fig A.4