Certificate #3682.01

TEST REPORT

No. I20D00115-SAR01

For

Client:	**MobiWire SAS**
Production:	**4G Smart Phone**
Model Name:	**MobiWire Sora |H5024,Smart E11 (H5024)**
Brand Name:	**MobiWire,Vodafone**
FCC ID:	**QPN-SORA**
Hardware Version:	**V01A**
Software Version:	**SORA_EU_V01_200630**
Issued date:	**2020-09-16**

NOTE

1. The test results in this test report relate only to the devices specified in this report.
2. This report shall not be reproduced except in full without the written approval of East China Institute of Telecommunications.
3. KDB has not been approved by A2LA.
4. It has been confirmed with the customer that the Tune-up Power information provided by the customer may affect the validity of the measurement results in this report, and the impact and consequences will be borne by the customer.
5. For the test results, the uncertainty of measurement is not taken into account when judging the compliance with specification, and the results of measurement or the average value of measurement results are taken as the criterion of the compliance with specification directly.

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Revision Version

Report Number	Revision	Date	Memo
I20D00115-SAR01	00	2020-08-21	Initial creation of test report
I20D00115-SAR01	01	2020-09-16	Second creation of test report

CONTENTS

1. Test Laboratory

1.1. Testing Location

Company Name	East China Institute of Telecommunications
Address	Building 4,No.766,Jingang Road,Pudong, Shanghai, P. R. China
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1.2. Testing Environment

Normal Temperature	18℃-25℃
Relative Humidity	25%RH-75%RH

1.3. Project Data

Project Leader	Yu Anlu
Testing Start Date	2020-08-20
Testing End Date	2020-09-14

1.4. Signature

Gong Jiawei
(Prepared this test report)

Yan Hang
(Reviewed this test report)

Zheng Zhongbin
(Approved this test report)

2. Client Information

2.1. Applicant Information

Company Name	MobiWire SAS
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2.2. Manufacturer Information

Company Name	MobiWire SAS
Address	79 avenue Francois Arago, 92000 NANTERRE France.
Telephone	+86 574 59555707
Postcode	N/A

3. Equipment Under Test (EUT) and Ancillary Equipment (AE)

3.1. About EUT

Description:	4G Smart Phone
Model name:	MobiWire Sora |H5024,Smart E11 (H5024)
Operation Model(s):	GSM850/GSM900/GSM1800/GSM1900 WCDMA Band I/Band II/Band V/BandVIII LTE 1/3/7/20; BT4.2,BLE;WiFi 802.11a/b/g/n GPS;GLONASS;
Tx Frequency:	824-849MHz(GSM850) 1850-1910MHz（GSM1900） 1850-1910 MHz (WCDMA Band II) 824-849MHz (WCDMA Band V) 2500 – 2570 MHz (LTE Band 7) 2412- 2462 MHz (WiFi) 5150~5250 MHz(U-NII-1) 5250~5350 MHz(U-NII-2A) 5470~5725 MHz(U-NII-2C) 5725~5850 MHz(U-NII-3) 2402 – 2480 MHz (BT)
Test device Production information: GPRS/EGPRS Class Mode: GPRS/ EGPRS Multislot Class:	Production unit B 12
Device type:	Portable device
Antenna type:	Inner antenna
Accessories/Body-worn configurations:	Battery
Dimensions: Hotspot Mode:	140.75x67.65x10.3(mm) Support

3.2. Internal Identification of EUT used during the test

EUT ID*	SN or IMEI	HW Version	SW Version	Date of receipt
N01	354392850002224	V10A	SORA_EU_V01_200630	2020-07-27

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

3.3. Internal Identification of AE used during the test

AE ID*	Description	Type	Manufacturer
BA26	Battery	--	--

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

4. Reference Documents

4.1. Documents supplied by applicant

All technical documents are supplied by the client or manufacturer, which is the basis of testing.

4.2. Reference Documents

The following documents listed in this section are referred for testing.

Reference	Title	Version
ANSI C95.1	IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.	**1999**
IEEE 1528	Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Body Due to Wireless Communications Devices: Experimental Techniques.	**2013**
KDB648474	Handset SAR	**D04 v01r03**
KDB648474	Wireless Chargers Battery Cover	**D03 v01r04**
KDB248227	802 11 WiFi SAR	**D01 v02r02**
KDB447498	General RF Exposure Guidance	**D01 v06**
KDB865664	SAR Measurement 100 MHz to 6 GHz	**D01 v01r04**
KDB865664	RF Exposure Reporting	**D02 v01r02**
KDB941225	3G SAR Procedures	**D01 v03r01**
KDB941225	SAR for LTE Devices	**D05 v02r05**
KDB941225	Hotspot SAR	**D06 v02r01**
KDB616217	SAR for laptop and tablets	**D04 v01r02**

4.3. Criterion

At frequencies between 100 kHz and 6 GHz, the MPE (Maximum Permissible Exposure) in population/ uncontrolled environments for electromagnetic field strengths may be exceeded if

a) The exposure conditions can be shown by appropriate techniques to produce SARs below 0.08W/kg, as averaged over the whole body, and spatial peak SAR values not exceeding 1.6 W/kg, as averaged over any 1g of tissue (defined as a tissue volume in the shape of a cube), except for the hands, wrists, feet, and ankles where the spatial peak SAR shall not exceed 4 W/kg, as averaged over any 10g of tissue (defined as a tissue volume in the shape of a cube); and

b) The induced currents in the body confirm with the MPE in table 2, Part B in ANSI C95.1-1999.

5. Test Summary and Statement of Compliance

5.1. Test Summary

The maximum results of Specific Absorption Rate (SAR) in standalone mode are as follows.

Table 5.1: Standalone Max. Reported SAR

Band	SAR 1g(W/Kg)		
	Head	Body worn(10mm)	Hotspot(10mm)
GSM 850	0.184	0.367(variation)	0.367(variation)
GSM 1900	0.350	**1.176**	1.266(variation)
WCDMA Band2	0.352	0.722	0.989(variation)
WCDMA Band5	0.192	0.308(variation)	0.308(variation)
LTE Band7	0.285	0.808	**1.353**(variation)
2.4G WiFi	**0.465**(variation)	0.109	0.109
5G WiFi	0.255(variation)	0.093	0.120

Table 2.2: Simultaneous SAR

Highest SAR 1g(W/kg)		
Mode	Position	Highest SAR 1g(W/kg)
WCDMA B2&WIFI2.4G	Head Side	0.817(variation)
GSM1900&BT	Body worn(10mm)	1.308
LTE B7&BT	Hotspot(10mm)	**1.353**(variation)

Note: The **MobiWire Sora |H5024,Smart E11 (H5024)**, supporting 2G/3G /WLAN, manufactured by **MobiWire SAS** is a variant product for testing. According to the Product Change Description, SAR test is only required in worse case. Test data are reflected from test report **I19D00035-SAR01**, which is the test report for the initial product.

5.2. Statement of Compliance

The **MobiWire Sora |H5024,Smart E11 (H5024)** manufactured by **MobiWire SAS** is a parent model for testing.

ECIT has verified that the compliance of the tested device specified in section 3 of this test report is successfully evaluated according to the procedure and test methods as defined in type certification requirement listed in section 4 of this test report.

For body worn operation mode, this device with any accessory that contained in this report has been tested and the values meet FCC RF exposure guidelines. Use of other accessories may not ensure compliance with FCC RF exposure guidelines.

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:

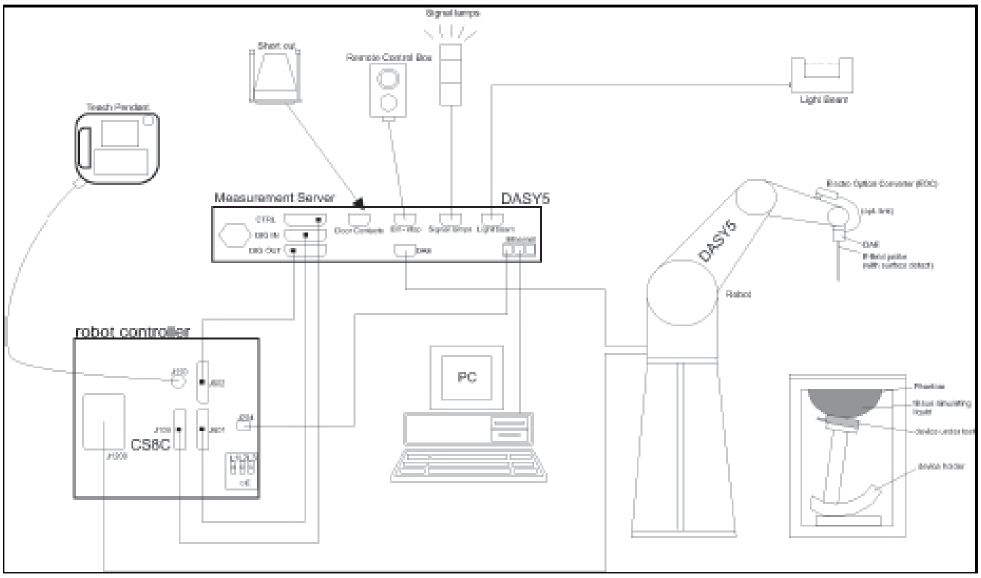
- σ is the conductivity of the tissue
- ρ is the mass density of tissue, which is normally set to 1g/cm^3
- E is the RMS electrical field strength

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

7. SAR Measurement System Introduction

7.1. Measurement Set-up

The DASY5 system for performing compliance tests is illustrated above graphically. This system consists of the following items:



Picture 7-1 SAR Measurement Set-up

- A standard high precision 6-axis robot (Stäubli TX=RX family) 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 and the DASY5 software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- The phantom, the device holder and other accessories according to the targeted measurement.

7.2. E-field Probe System

The SAR measurements were conducted with the dosimetric probe designed in the classical triangular configuration and optimized for dosimetric evaluation. The probe is constructed using the thick film technique; with printed resistive lines on ceramic substrates. The probe is equipped with an optical multi-fiber line ending at the front of the probe tip. It is connected to the EOC box on the robot arm and provides an automatic detection of the phantom surface. Half of the fibers are connected to a pulsed infrared transmitter, the other half to a synchronized receiver. As the probe approaches the surface, the reflection from the surface produces a coupling from the transmitting to the receiving fibers. This reflection increases first during the approach, reaches maximum and then decreases. If the probe is flatly touching the surface, the coupling is zero. The distance of the coupling maximum to the surface is independent of the surface reflectivity and largely independent of the surface to probe angle. The DASY5 software reads the reflection during a software approach and looks for the maximum using 2nd ord curve fitting. The approach is stopped at reaching the maximum.

Probe Specifications:	
Model:	**ES3DV3,EX3DV4**
Frequency Range:	**10MHz — 6GHz(EX3DV4)**
	10MHz — 4GHz(ES3DV3)
Calibration:	**In head and body simulating tissue at frequency from 650MHz to 5900MHz**
Linearity:	**± 0.2 dB(30 MHz to 4 GHz) for ES3DV3** **± 0.2 dB(30 MHz to 6 GHz) for EX3DV4**
Dynamic Range:	**10 mW/kg — 100 W/kg**
Probe Length:	**330 mm**
Probe Tip Length:	**20 mm**
Body Diameter:	**12 mm**
Tip Diameter: **Tip-Center:**	**2.5 mm (3.9 mm for ES3DV3)** **1 mm (2.0mm for ES3DV3)**
Application:	**SAR Dosimetry Testing** **Compliance tests of mobile phones** **Dosimetry in strong gradient fields**

Picture 7-2 Detail of Probe

Picture 7-3 E-field Probe

7.3. E-field Probe Calibration

Each E-Probe/Probe Amplifier combination has unique calibration parameters. A TEM cell calibration procedure is conducted to determine the proper amplifier settings to enter in the probe parameters. The amplifier settings are determined for a given frequency by subjecting the probe to a known E-field density (1 mW/cm^2) using an RF Signal generator, TEM cell, and RF Power Meter.

The free space E-field from amplified probe outputs is determined in a test chamber. This calibration can be performed in a TEM cell if the frequency is below 1 GHz and inn a waveguide or other methodologies above 1 GHz for free space. For the free space calibration, the probe is placed in the volumetric center of the cavity and at the proper orientation with the field. The probe is then rotated 360 degrees until the three channels show the maximum reading. The power density readings equates to 1 mW/cm^2.

E-field temperature correlation calibration is performed in a flat phantom filled with the appropriate simulated brain tissue. The E-field in the medium correlates with the temperature rise in the dielectric medium. For temperature correlation calibration a RF transparent thermistor-based temperature probe is used in conjunction with the E-field probe.

$$SAR = C\frac{\Delta T}{\Delta t}$$

Where:

Δt = Exposure time (30 seconds),

C = Heat capacity of tissue (brain or muscle),

ΔT = Temperature increase due to RF exposure.

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

Where:

σ = Simulated tissue conductivity,

ρ = Tissue density (kg/m^3).

7.4. Other Test Equipment

7.4.1. Data Acquisition Electronics (DAE)

The data acquisition electronics consist 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 with a 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 mechanical probe mounting device includes two different sensor systems for frontal and sideways probe contacts. They are used for mechanical surface detection and probe collision detection.
The input impedance of the DAE is 200M Ohm; the inputs are symmetrical and floating. Common mode rejection is above 80dB.

Picture 7-4: DAE

7.4.2. Robot

The SPEAG DASY system uses the high precision robots (DASY5: TX90) type from Stäubli SA (France).
For the 6-axis controller system, the robot controller version from Stäubli is used. The Stäubli robot series have many features that are important for our application:

- ➢ High precision (repeatability 0.02mm)
- ➢ High reliability (industrial design)
- ➢ Low maintenance costs (virtually maintenance free due to direct drive gears; no belt drives)
- ➢ Jerk-free straight movements (brushless synchronal motors; no stepper motors)
- ➢ Low ELF interference (motor control fields shielded via the closed metallic construction shields)

Picture 7-5: DASY 5

7.4.3. Measurement Server

The Measurement server is based on a PC/104 CPU broad with CPU (DASY5: 400 MHz, Intel Celeron), chip disk (DASY5: 128MB), RAM (DASY5: 128MB). The necessary circuits for communication with the DAE electronic box, as well as the 16 bit AD converter system for optical detection and digital I/O interface are contained on the DASY I/O broad, which is directly connected to the PC/104 bus of the CPU broad.

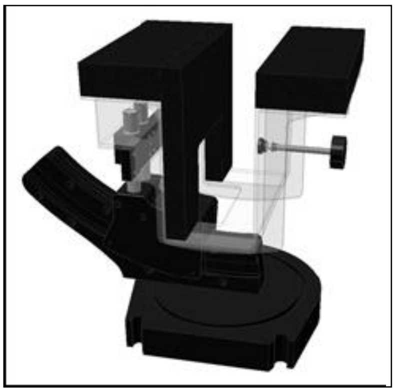
Picture 7-6: Server for DASY 5

The measurement server performs all real-time data evaluation of field measurements and surface detection, controls robot movements and handles safety operation. The PC operating system cannot interfere with these time critical processes. All connections are supervised by a watchdog, and disconnection of any of the cables to the measurement server will automatically disarm the robot and disable all program-controlled robot movements. Furthermore, the measurement server is equipped with an expansion port which is reserved for future applications. Please note that this expansion port does not have a standardized pinout, and therefore only devices provided by SPEAG can be connected. Devices from any other supplier could seriously damage the measurement server.

7.4.4. Device Holder for Phantom

The SAR in the phantom is approximately inversely proportional to the square of the distance between the source and the liquid surface. For a source at 5mm distance, a positioning uncertainty of ±0.5mm would produce a SAR uncertainty of ±20%. Accurate device positioning is therefore crucial for accurate and repeatable measurements. The positions in which the devices must be measured are defined by the standards.

The DASY device holder is designed to cope with the different positions given in the standard. It has two scales for device rotation (with respect to the body axis) and device inclination (with respect to the line between the ear reference points). The rotation centers for both scales is the ear reference point (ERP). Thus the device needs no repositioning when changing the angles. The DASY device holder is constructed of low-loss POM material having the following dielectric parameters: relative permittivity ε =3 and loss tangent δ =0.02. The amount of dielectric material has been reduced in the closest vicinity of the device, since measurements have suggested that the influence of the clamp on the test results could thus be lowered.	 **Picture 7-7: Device Holder**

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 positioner. The extension is fully compatible with the Twin-SAM and ELI phantoms. The DASY device holder is constructed of low-loss POM material having the following dielectric parameters: relative permittivity ε =3 and loss tangent δ =0.02. The amount of dielectric material has been reduced in the closest vicinity of the device, since measurements have suggested that the influence of the clamp on the test results could thus be lowered.	 **Picture 7-8: Laptop Extension Kit**

7.4.5. Phantom

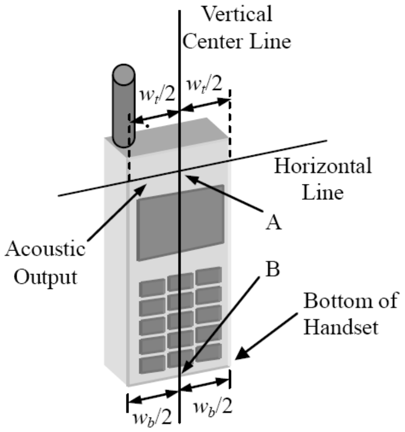
The SAM Twin Phantom V4.0 is constructed of a fiberglass shell integrated in a table. The shape of the shell is based on data from an anatomical study designed to represent the 90th percentile of the population. The phantom enables the dissymmetric evaluation of SAR for both left and right handed handset usage, as well as body-worn usage using the flat phantom region. Reference markings on the Phantom allow the complete setup of all predefined phantom positions and measurement grids by manually teaching three points in the robot. The shell phantom has a 2mm shell thickness (except the ear region where shell thickness increases to 6 mm).

Shell Thickness:	2 ± 0.2 mm	
Available:	Special	
Filling Volume:	Approx. 25 liters	
Dimensions:	810 x l000 x 500 mm (H x L x W)	**Picture 7-9: SAM Twin Phantom**

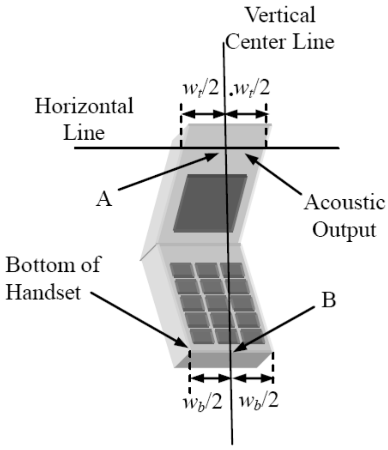
8. Test Position in Relation to the Phantom

8.1. General considerations

This standard specifies two handset test positions against the head phantom – the “cheek” position and the “tilt” position.

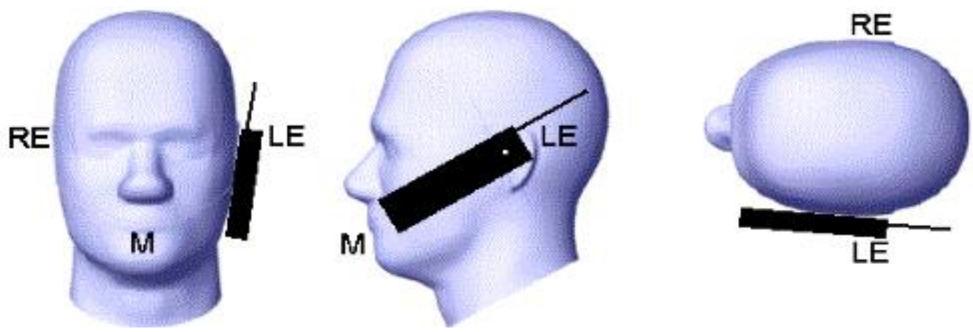


Picture 8-1 Typical “fixed” case handset

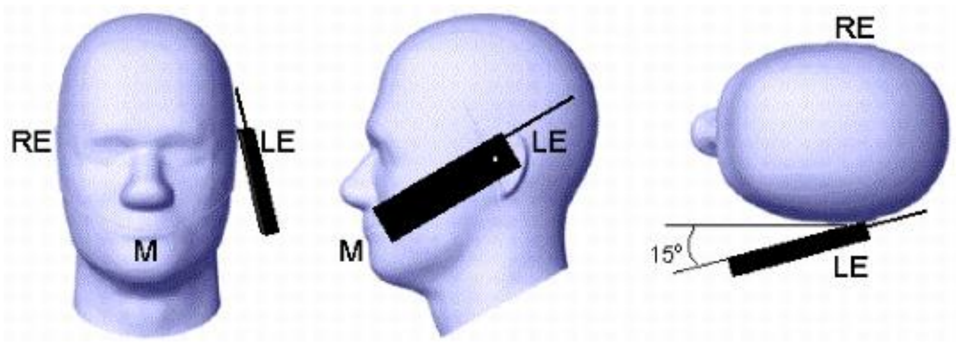


Picture 8-2 Typical “clam-shell” case handset

W_t	Width of the handset at the level of the acoustic
W_b	Width of the bottom of the handset
A	Midpoint of the width W_t of the handset at the level of the acoustic output
B	Midpoint of the width W_b of the bottom of the handset



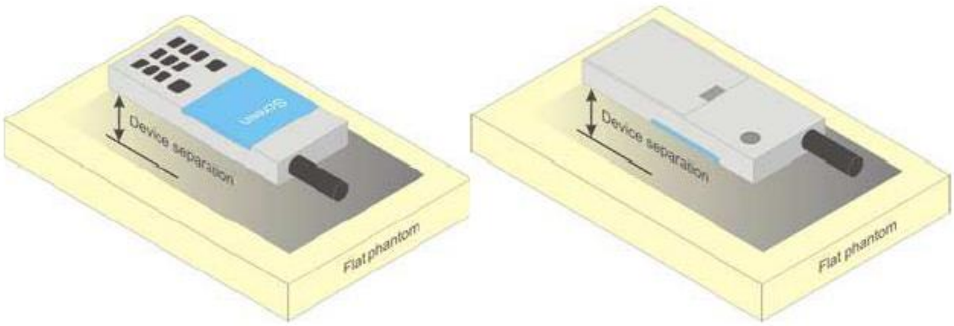
Picture 8-3 Cheek position of the wireless device on the left side of SAM



Picture 8-4 Tilt position of the wireless device on the left side of SAM

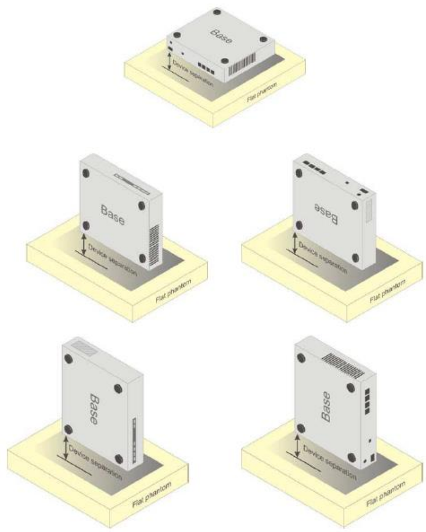
8.2. Body-worn device

A typical example of a body-worn device is a mobile phone, wireless enabled PDA (personal digital assistant) or other battery operated wireless device with the ability to transmit while mounted on a person's body using a carry accessory approved by the wireless device manufacturer.



Picture 8-5 Test positions for body-worn devices

8.3. Desktop device

A typical example of a desktop device is a wireless enabled desktop computer placed on a table or desk when used. The DUT shall be positioned at the distance and in the orientation to the phantom that corresponds to the intended use as specified by the manufacturer in the user instructions. For devices that employ an external antenna with variable positions. Tests shall be performed for all antenna positions specified. Picture 8-6 shows positions for desktop device SAR tests. If the intended use is not specified, the device shall be tested directly against the flat phantom.	 Picture 8-6 Test positions for desktop devices

9. Tissue Simulating Liquids

9.1. Equivalent Tissues Composition

The liquid used for the frequency range of 650-6000 MHz consisted of water, sugar, salt, preventol, glycol monobutyl and Cellulose. The liquid has been previously proven to be suited for worst-case. The Table 9.1 shows the detail solution. It's satisfying the latest tissue dielectric parameters requirements proposed by the IEEE 1528 and IEC 62209.

Table 9.1: Composition of the Head Tissue Equivalent Matter

Frequency (MHz)	835	900	1800	1950	2300	2450	2600	5800
Ingredients (% by weight)								
Water	41.45	40.92	55.242	54.89	56.34	58.79	58.79	65.53
Sugar	56.0	56.5	/	/	/	/	/	
Salt	1.45	1.48	0.306	0.18	0.14	0.06	0.06	
Preventol	0.1	0.1	/	/	/	/	/	
Cellulose	1.0	1.0	/	/	/	/	/	
GlycolMonobutyl	/	/	44.452	44.93	43.52	41.15	41.15	
Diethylenglycol momohexylether	/	/	/	/	/	/	/	17.24
Triton X-100	/	/	/	/	/	/	/	17.23
Dielectric Parameters Target Value	ε=41.5 σ=0.90	ε=41.5 σ=0.97	ε=40.0 σ=1.40	ε=40.0 σ=1.40	ε=39.5 σ=1.67	ε=39.2 σ=1.80	ε=39.0 σ=1.96	ε=35.3 σ=5.27

Table 9.2: Targets for tissue simulating liquid

Frequency (MHz)	Liquid Type	Conductivity (σ)	± 5% Range	Permittivity (ε)	± 5% Range
835	Head	0.90	0.874~0.97	41.5	39.4~43.6
900	Head	0.97	0.92~1.02	41.5	39.4~43.6
1800	Head	1.40	1.33~1.47	40.0	38.0~42.0
1950	Head	1.40	1.33~1.47	40.0	38.0~42.0
2300	Head	1.67	1.59~1.75	39.5	37.5~41.4
2450	Head	1.80	1.71~1.89	39.2	37.2~41.2
2600	Head	1.96	1.86~2.06	39.0	37.5~40.95
5200	Head	4.66	4.43~4.89	35.99	34.19~37.79
5300	Head	4.76	4.52~4.99	35.87	34.08~37.66
5500	Head	4.96	4.71~5.2	35.6	33.82~37.38
5600	Head	5.07	4.82~5.32	35.53	33.75~37.30
5800	Head	5.27	5.01~5.53	35.3	33.54~37.05

Note: Effective February 19, 2019, FCC has permitted the use of single head-tissue simulating liquid specified in IEC 62209-1 for all SAR tests.

9.2. Dielectric Performance of TSL

Table 9.3: Dielectric Performance of Head Tissue Simulating Liquid

Tissue Simulating Liquid								
Frequency (MHz)	**Head(Standard)**		**Temperature**	**Date**	**Test Result**		**Deviation (%)**	
	Permittivity ε	**Conductivity σ**			**Permittivity ε**	**Conductivity σ**	**Permittivity ε**	**Conductivity σ**
835	41.50	0.90	22.5℃	2020/9/11	42.584	0.931	2.61%	3.44%
1900	40.00	1.40	22.5℃	2020/9/11	38.987	1.45	-2.53%	3.57%
2450	39.20	1.80	22.5℃	2020/9/14	38.307	1.811	-2.28%	0.61%
2600	39.00	1.96	22.5℃	2020/8/20	38.064	1.923	-2.40%	-1.89%
5200	36	4.66	22.5℃	2020/9/14	37.215	4.566	3.38%	-2.02%
5600	35.5	5.07	22.5℃	2020/9/14	36.46	5.004	2.70%	-1.30%
5800	35.3	5.27	22.5℃	2020/9/14	36.092	5.227	2.24%	-0.82%

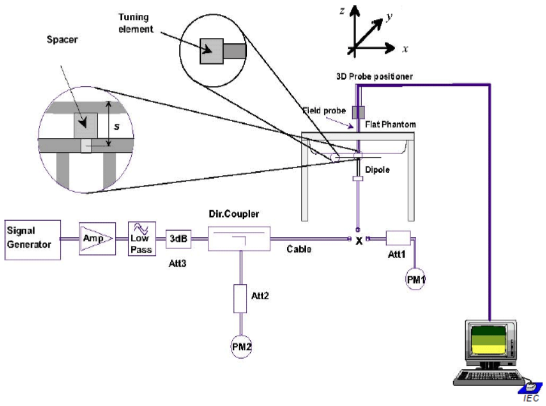
10. System Validation

10.1. System Validation

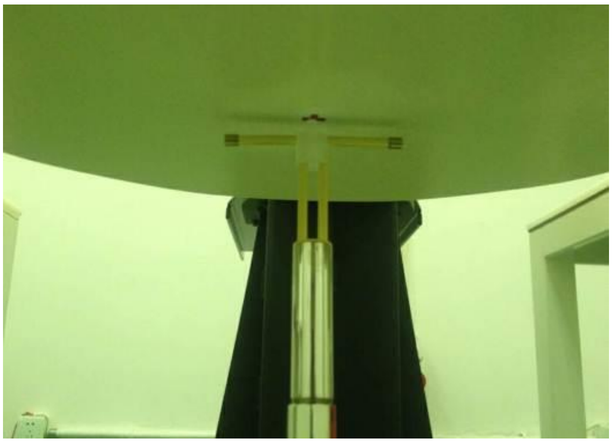
Each DASY system is equipped with one or more system validation kits. These units, together with the predefined measurement procedures within the DASY software, enable the user to conduct the system performance check and system validation. System validation kit includes a dipole, tripod holder to fix it underneath the flat phantom and a corresponding distance holder.

10.2. 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 10-1 Setup for System Evaluation



Picture 10-2. Setup for Dipole

10.3. System Validation Result

Table 10.1: System Validation Result of SAR

SAR System Validation								
Frequency (MHz)	Average Target Value (w/kg)		Temperature	Date	Test Result (w/kg)		Deviation (%)	
	10g	1g			10g	1g	10g	1g
835	6.25	9.63	22.5℃	2020/9/11	6.4	9.96	2.40%	3.43%
1900	20.6	39.6	22.5℃	2020/9/11	20.6	40	0.00%	1.01%
2450	24.4	52.4	22.5℃	2020/9/14	25.08	54	2.79%	3.05%
2600	25.4	57.2	22.5℃	2020/8/20	25	55.2	-1.57%	-3.50%
5200	21.4	74.9	22.5℃	2020/9/14	21.6	72.5	0.93%	-3.20%
5600	22.2	79.3	22.5℃	2020/9/14	22.9	77.7	3.15%	-2.02%
5800	20.7	73.7	22.5℃	2020/9/14	21.6	73.6	4.35%	-0.14%
Note:The system verifies that the measured input power level is equivalent to 250mW, and the measured results are compared with the target value by converting to 1W.								

11. Measurement Procedures

11.1. Test Steps

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

(a) Power reference measurement

The reference and drift jobs are useful for monitoring the power drift of the device under test in the batch process. Both jobs measure the electric field strength at a specified reference position, at a selectable distance from the phantom surface. The reference position can be either the selected section's grid reference point or a user point in this section. The reference job projects the selected point onto the phantom surface, orients the probe perpendicularly to the surface, and approaches the surface using the selected detection method.

(b) 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 finer measurement around the hot spot. The sophisticated interpolation routines implemented in DASY software can find the maximum locations even in relatively coarse grids. The scan area is defined by an editable grid. This grid is anchored at the grid reference point of the selected section in the phantom. When the area scan's property sheet is brought up, grid was at to 15mm * 15mm and can be edited by users.

(c) Zoom scan

Zoom scans are used to assess the peak spatial SAR values within a cubic averaging volume containing 1g and 10g of simulated tissue. The default zoom scan measures 5 * 5 * 7 points within a cube whose base faces are centered around the maximum found in a preceding area scan job within the same procedure. If the preceding Area Scan job indicates more than one maximum, the number of Zoom Scans has to be enlarged accordingly.

(d) Power drift measurement

The drift job measures the field at the same location as the most recent reference job within the same procedure, and with the same setting. The drift measurement gives the field difference in dB from the reading conducted within the last reference measurement. Several drift measurements are possible for one reference measurement. This allows a user to monitor the power drift of the device under within a batch process. In the properties of the drift job, the user can specify a limit for the drift and have DASY software stop the measurements if this limit is exceeded. This ensures that the power drift during one measurement is within 5%.

The SAR measurement procedures for each of test conditions are as follows:

(a) Make EUT to transmit it maximum output power

(b) Measure conducted output power through RF cable

(c) Place the EUT in the specific position of phantom

(d) Measure SAR results for Middle channel or the highest power channel on each testing position

(e) 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

(f) Record the SAR value

11.2. Spatial Peak SAR Evaluation

The procedure for spatial peak SAR evaluation has been implemented according to the IEEE1529 standard. It can be conducted for 1g and 10g.

The DASY system allows evaluations that combine measured data and robot positions, such as:

a) Maximum Search

During a maximum search, global and local maximum searches are automatically performed in 2D after each Area Scan measurement with at least 6 measurement points. It is based on the evaluation of the local SAR gradient calculated by the Quadratic Shepard's method. The algorithm will find the global maximum and all local maxima within -2dB of the global maxima for all SAR distributions.

b) Extrapolation

Extrapolation routines are used to obtain SAR values between the lowest measurement points and the inner phantom surface. The extrapolation distance is determined by the surface detection distance and the probe sensor offset. Several measurements at different distances are necessary for the extrapolation. Extrapolation routines require at least 10 measurement points in 3D space. They are used in the Cube Scan to obtain SAR values between the lowest measurement points and the inner phantom surface. The routine uses the modified Quadratic Shepard's method for extrapolation. For a grid using 5*5*5 measurement points with 5mm resolution amounting to 343 measurement points, the uncertainty of the extrapolation routines is less than 1% for 1g and 10 cubes.

c) Boundary effect

For measurements in the immediate vicinity of a phantom surface, the field coupling effects between the probe and the boundary influence the probe characteristics. Boundary effect errors of different dosi-metric probe types have been analyzed by measurements and using a numerical probe model. As expected, both methods showed an enhanced sensitivity in the immediate vicinity of the boundary. The effect strongly depends on the probe dimensions and disappears with increasing distance from the boundary. The sensitivity can be approximately given as:

$$S \approx So + Sb * \exp\left(-\frac{z}{a}\right) * \cos(\pi\frac{z}{\lambda})$$

Since the decay of the boundary effect dominates for small probe (a≪ λ), the cos-term can be omitted. Factors Sb (parameter Alpha in the DASY software) and a (parameter Delta in the DASY software) ard assessed during probe calibration and used for numerical compensation of the boundary effect. Several simulations and measurements have confirmed that the compensation is valid for different field and boundary configurations.

This simple compensation procedure can largely reduce the probe uncertainty near boundaries. It works well as long as:

- ➢ The boundary curvature is small
- ➢ The probe axis is angled less than 30_to the boundary normal
- ➢ The distance between probe and boundary is larger than 25% of the probe diameter
- ➢ The probe is symmetric (all sensors have the same offset from the probe tip)

Since all of these requirements are fulfilled in a DASY system, the correction of the probe boundary effect in the vicinity of the phantom surface is performed in a fully automated manner via the measurement data extraction during post processing.

11.3. 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 11.1: Test Resolution Requirement

<table>
<tr><th colspan="3">Items</th><th>≤3GHz</th><th>>3GHz</th></tr>
<tr><td colspan="3">Maximum Distance</td><td>5mm ±1mm</td><td>$\frac{1}{2} * \delta * \ln(2)$ mm ±0.5mm</td></tr>
<tr><td colspan="3">Maximum probe angle</td><td>30±1°</td><td>20±1°</td></tr>
<tr><td colspan="3" rowspan="3">Maximum Area Scan spatial resolution:
Δx_{Area}, Δy_{Area}</td><td>≤2GHz: ≤15mm</td><td>3-4GHz: ≤12mm</td></tr>
<tr><td>2-3GHz: ≤12mm</td><td>4-6GHz: ≤10mm</td></tr>
<tr><td colspan="2">when the x or y dimension of the device , in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the device with at least one measurement point on the device</td></tr>
<tr><td colspan="3" rowspan="2">Maximum Zoom Scan spatial resolution:
Δx_{Zoom}, Δy_{Zoom}</td><td>≤2GHz: ≤8mm</td><td>3-4GHz: ≤5mm</td></tr>
<tr><td>2-3GHz: ≤5mm</td><td>4-6GHz: ≤4mm</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>≤5mm</td><td>3-4GHz: ≤4mm
4-5GHz: ≤3mm
5-6GHz: ≤2mm</td></tr>
<tr><td rowspan="2">graded grid</td><td>$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface</td><td>≤4mm</td><td>3-4GHz: ≤3mm
4-5GHz: ≤2.5mm
5-6GHz: ≤2mm</td></tr>
<tr><td>$\Delta z_{Zoom}(n>1)$ between subsequent points</td><td colspan="2">≤1.5*</td></tr>
<tr><td>minimum zoom scan volume</td><td colspan="2">x, y, z</td><td>≥30mm</td><td>3-4GHz: ≥28mm
4-5GHz: ≥25mm
5-6GHz: ≥22mm</td></tr>
</table>

Notes:
δ is the penetration depth of a plane-wave at normal incidence to the tissue medium in IEEE 1528-2013.
When Zoom Scan is required and reported SAR from the Area Scan based 1-g SAR estimation procedure of KDB publication 447498 is ≤1.4 W/kg, ≤8mm for 2GHz-3GHz, ≤7mm for 3GHz-4GHz, ≤5mm for 4GHz-6GHz Zoom Scan resolution may be applied.

11.4. WCDMA Measurement Procedures

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 & DPDCHn), 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.

Table 11.2: HSDPA setting for Release 5

Sub-test	β_c	β_d	β_d (SF)	β_c / β_d	β_{hs}	CM (dB)	MPR (dB)
1	2/15	15/15	64	2/15	4/15	1.5	0.5
2	12/15	15/15	64	12/15	24/25	2.0	1
3	15/15	8/15	64	15/8	30/15	2.0	1
4	15/15	4/15	64	15/4	30/15	2.0	1

Table 11.3: HSUPA setting for Release 6

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	2.0	1.0	20	75
2	6/15	15/15	64	6/15	12/15	12/15	12/15	4	1	3.0	2.0	12	67
3	15/15	9/15	64	15/9	30/15	30/15	β_{ed1}:47/15 β_{ed2}:47/15	4	2	3.0	2.0	15	92
4	2/15	15/15	64	2/15	4/15	4/15	56/75	4	1	2.0	1.0	17	71
5	15/15	15/15	64	15/15	24/15	30/15	134/15	4	1	2.0	1.0	21	81

Note:

A KDB inquiry is required to address test and approval requirements when the maximum output power measured in HS-DPCCH Sub-test 2 – 4 is higher than Sub-test 1.
A KDB inquiry is required to determine test and approval requirements when the maximum output power measured in E-DCH Sub-test 2 – 4 is higher than Sub-test 5.

11.5. LTE Measurement Procedure

SAR tests for LTE are performed with a base station simulator. Closed loop power control was used so the UE transmits with maximum output power during SAR testing.
1. Per KDB 941225 D05, 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. 50% RB allocation for QPSK SAR testing follows 1RB QPSK allocation procedure.
3. 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. 16QAM/64QAM output power for each RB allocation configuration is ＞ not $\frac{1}{2}$dB higher than the same configuration in QPSK and the reported SAR for the QPSK configuration is ≤ 1.45 W/kg; 16QAM/64QAM SAR testing is not required.

5. Smaller bandwidth output power for each RB allocation configuration is ＞not $\frac{1}{2}$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; smaller bandwidth SAR testing is not required.
6. For LTE B12 / B26 the maximum bandwidth does not support three non-overlapping channels, 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 17 / 2 / 5 / 38 / 4 SAR test was covered by Band 12 / 25 / 26 / 41 / 66; 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.

LTE Carrier Aggregation Conducted Power (Downlink)

According to KDB941225 D05A v01r02, Uplink maximum output power measurement with downlink carrier aggregation active should be measured, using the highest output channel measured without downlink carrier aggregation, to confirm that uplink maximum output power with downlink carrier aggregation active remains within the specified tune-up tolerance limits and not more than ¼ dB higher than the maximum output measured without downlink carrier aggregation active.

LTE TDD Considerations

According to KDB 941225 D05 SAR for LTE Devices, for Time-Division Duplex (TDD) systems, SAR must be tested using a fixed periodic duty factor according to the highest transmission duty factor implemented

for the device and supported by the defined 3GPP LTE TDD configurations.
SAR was tested with the highest transmission duty factor (63.33%) using Uplink-downlink configuration 0 and Special sub-frame configuration 7.
LTE TDD Band 41 supports 3GPP TS 36.211 section 4.2 for Type 2 Frame Structure and Table 4.2-2 for uplink-downlink configurations and Table 4.2-1 for Special sub-frame configurations.

Table 11.4 Calculated Duty Cycle for LTE TDD

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

Example for Calculated Duty Cycle for Uplink-Downlink Configuration 0:
Calculated Duty Cycle = (5120 × Ts × 2 + 6 ms) / 10ms = 63.33%
Where
Ts = 1/(15000 x 2048) seconds

11.6. Bluetooth & WiFi Measurement Procedures

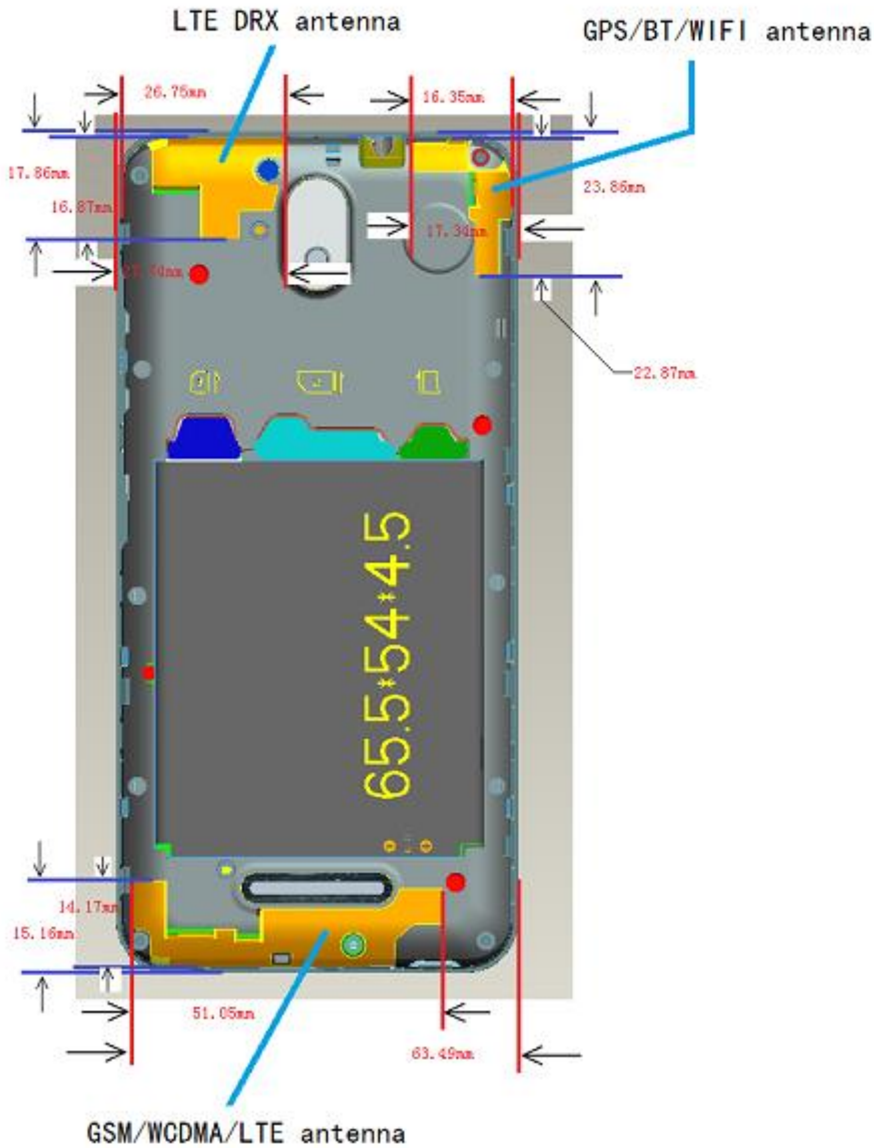
Normal network operating configurations are not suitable for measuring the SAR of 802.11 transmitters in general. Unpredictable fluctuations in network traffic and antenna diversity conditions can introduce undesirable variations in SAR results. The SAR for these devices should be measured using chipset 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.

12. Simultaneous Transmission SAR Considerations

12.1. Reference Document

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.

12.2. Antenna Separation Distances



Picture 12-1 Antenna Locations

12.3. SAR Measurement Positions

According to the KDB941225 D06 Hot Spot SAR v01, the edges with less than 2.5 cm distance to the antennas need to be tested for SAR.

Table 12.1: SAR measurement Positions

Antenna Mode	Front	Back	Left	Right	Top	Bottom
2/3/4G	Yes	Yes	Yes	Yes	No	Yes
BT/WiFi	Yes	Yes	No	Yes	Yes	No

12.4. Low Power Transmitters SAR Consideration

Standalone 1-g head or body SAR evaluation by measurement or numerical simulation for low power transmitters 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:

$$\frac{\text{(max. power of channel, including tune-up tolerance, mW)}}{\text{(min. test separation distance, mm)}} * \sqrt{\text{Frequency (GHz)}} \leq 3.0$$

Where

- Frequency(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

According to the KDB447498 appendix A, the SAR test exclusion threshold for 2450MHz at 5mm test separation distances is 10mW. That means the transmitters with tune-up power below 10mW are excluded for SAR measurement.

12.5. Simultaneous Transmission Analysis

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

$$\mathrm{SPLSR} = \sqrt{(\mathrm{SAR1} + \mathrm{SAR2})^3}/\mathrm{Ri}$$

Where

- SAR1 is the highest measured or estimated SAR for the first of a pair of simultaneous transmitting antennas, in a specific test operating mode and exposure condition.
- SAR2 is the highest measured or estimated SAR for the second of a pair of simultaneous transmitting antennas, in the same test operating mode and exposure condition as the first.
- Ri is the separation distance between the pair of simultaneous transmitting antennas. When the SAR is measured, for both antennas in the pair, it is determined by the actual x, y and z coordinates in the 1-g SAR for each SAR peak location , based on the extrapolated and interpolated result in the zoom scan measurement, using the formula of

$$(x1 - x2)^2 + (y1 - y2)^2 + (z1 - z2)^2$$

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

$$\sqrt{(SAR1 + SAR2)^3}/Ri < 0.04$$

12.6. Simultaneous Transmission Table

Table 12.2: Simultaneous Transmission Configurations

Items	Capable Transmit Configurations
1	GSM/GPRS/EDGE + BT
2	GSM/GPRS/EDGE + WiFi 2.4G/ WiFi 5G
3	WCDMA + BT
4	WCDMA+ WiFi 2.4G/ WiFi 5G
5	LTE + BT
6	LTE + WiFi 2.4G/ WiFi 5G
Note: For the DUT, the WLAN and BT modules sharing a single antenna, and so these two modules can't transmit signal simultaneously. LTE / WCDMA and GSM modules sharing a single antenna, so these two modules can't transmit signal simultaneously. So we can get above combination that can transmit signal simultaneously.	

13. Conducted Output Power

13.1. Manufacturing tolerance

Table 12.1: GSM Speech

GSM 850			
Channel	Channel 128	Channel 190	Channel 251
Maximum Target Value (dBm)	33	33	33
GSM1900			
Channel	Channel 512	Channel 661	Channel 810
Maximum Target Value (dBm)	30	30	30

Table 12.2: GPRS (GMSK Modulation)

GSM 850				
Channel		**128**	**190**	**251**
1 Txslots	Maximum Target Value (dBm)	33	33	33
2 Txslots	Maximum Target Value (dBm)	32	32	32
3 Txslots	Maximum Target Value (dBm)	30.5	30.5	30.5
4 Txslots	Maximum Target Value (dBm)	29.5	29.5	29.5
GSM 1900				
Channel		**512**	**661**	**810**
1 Txslots	Maximum Target Value (dBm)	30	30	30
2 Txslots	Maximum Target Value (dBm)	29.5	29.5	29.5
3 Txslots	Maximum Target Value (dBm)	27.5	27.5	27.5
4 Txslots	Maximum Target Value (dBm)	26.5	26.5	26.5

Table 12.3: EGPRS (8-PSK Modulation)

GSM 850				
Channel		**128**	**190**	**251**
1 Txslots	Maximum Target Value (dBm)	28	28	28
2 Txslots	Maximum Target Value (dBm)	26	26	26
3 Txslots	Maximum Target Value (dBm)	24	24	24
4 Txslots	Maximum Target Value (dBm)	23	23	23
GSM 1900				
Channel		**512**	**661**	**810**
1 Txslots	Maximum Target Value (dBm)	27	27	27
2 Txslots	Maximum Target Value (dBm)	26	26	26
3 Txslots	Maximum Target Value (dBm)	24.5	24.5	24.5
4 Txslots	Maximum Target Value (dBm)	23.5	23.5	23.5

Table 12.4: WCDMA

WCDMA Band II			
Channel	Channel 9262	Channel 9400	Channel 9538
Maximum Target Value (dBm)	22.5	22.5	22.5

WCDMA Band II **HSDPA**				
Channel		9262	9400	9538
1	Maximum Target Value (dBm)	21.5	21.5	21.5
2	Maximum Target Value (dBm)	21.5	21.5	21.5
3	Maximum Target Value (dBm)	21	21	21
4	Maximum Target Value (dBm)	21	21	21
WCDMA Band II **HSUPA**				
Channel		9262	9400	9538
1	Maximum Target Value (dBm)	21	21	21

2	Maximum Target Value (dBm)	21.5	21.5	21.5
3	Maximum Target Value (dBm)	21	21	21
4	Maximum Target Value (dBm)	21.5	21.5	21.5
5	Maximum Target Value (dBm)	21.5	21.5	21.5

Table 12.5: WCDMA

WCDMA Band V			
Channel	4132	4183	4233
Maximum Target Value (dBm)	23	23	23

WCDMA Band V **HSDPA**				
Channel		4132	4183	4233
1	Maximum Target Value (dBm)	22	22	22
2	Maximum Target Value (dBm)	22	22	22
3	Maximum Target Value (dBm)	22	22	22
4	Maximum Target Value (dBm)	22	22	22
WCDMA Band V **HSUPA**				
Channel		4132	4183	4233
1	Maximum Target Value (dBm)	22	22	22
2	Maximum Target Value (dBm)	22	22	22
3	Maximum Target Value (dBm)	21	21	21
4	Maximum Target Value (dBm)	22	22	22
5	Maximum Target Value (dBm)	22	22	22

Table 12.6: LTE

LTE Band7			
RB Size	1	50%	100%
Maximum Target Value (dBm)	19.5	18.5	18.5

Table 12.7: WiFi

WiFi 802.11b 2.4G			
Channel	Channel 1	Channel 6	Channel 11
Maximum Target Value (dBm)	19.5	19.5	19.5
WiFi 802.11g 2.4G			
Channel	Channel 1	Channel 6	Channel 11
Maximum Target Value (dBm)	18	18	18
WiFi 802.11n 20M 2.4G			
Channel	Channel 1	Channel 6	Channel 11
Maximum Target Value (dBm)	17	17	17
WiFi 802.11n 40M 2.4G			
Channel	Channel 3	Channel 6	Channel 9
Maximum Target Value (dBm)	16	16	16

WiFi 802.11a				
Band	U-NII-1	U-NII-2A	U-NII-2C	U-NII-3
Maximum Target Value (dBm)	14	14	13	12
WiFi 802.11n HT20				
Band	U-NII-1	U-NII-2A	U-NII-2C	U-NII-3
Maximum Target Value (dBm)	14	14	13	12
WiFi 802.11n HT40				
Band	U-NII-1	U-NII-2A	U-NII-2C	U-NII-3
Maximum Target Value (dBm)	14	14	13	13

Table 12.8: Bluetooth

Bluetooth			
Channel	Channel 0	Channel 39	Channel 78
Maximum Target Value (dBm)	8	8	8

Table 12.9: BLE

Bluetooth			
Channel	Channel 0	Channel 19	Channel 39
Maximum Target Value (dBm)	8	8	8

13.2. GSM Measurement result

Table 12.10: The conducted power measurement results for GSM

GSM 850MHZ	Conducted Power (dBm)		
	Channel 128(824.2MHz)	**Channel 190(836.6MHz)**	**Channel 251(848.8MHz)**
	32.52	32.58	32.51
GSM 1900MHZ	**Conducted Power(dBm)**		
	Channel 512(1850.2MHz)	**Channel 661(1880 MHz)**	**Channel 810(1909.8MHz)**
	29.89	29.86	29.65

Table 12.11: The conducted power measurement results for GPRS/EGPRS

GSM 850 GMSK	Measured Power (dBm)			calculation	Averaged Power (dBm)		
	128	**190**	**251**		**128**	**190**	**251**
1 Txslot	32.52	32.59	32.57	-9.03dB	23.49	23.56	23.54
2 Txslots	31.25	31.2	31.3	-6.02dB	25.23	25.18	25.28
3 Txslots	29.32	29.27	29.36	-4.26dB	25.06	25.01	25.1
4 Txslots	28.21	28.17	28.25	-3.01dB	25.2	25.16	25.24
GSM 1900 GMSK	Measured Power (dBm)			calculation	Averaged Power (dBm)		
	512	**661**	**810**		**512**	**661**	**810**
1 Txslot	29.89	29.83	29.61	-9.03dB	20.86	20.8	20.58
2 Txslots	29.08	29.04	28.83	-6.02dB	23.06	23.02	22.81
3Txslots	27.25	27.23	27.03	-4.26dB	22.99	22.97	22.77
4 Txslots	26.23	26.21	26.01	-3.01dB	23.22	23.2	23

Table 12.12: The conducted power measurement results for E-GPRS

GSM 850 8-PSK	Measured Power (dBm)			calculation	Averaged Power (dBm)		
	128	**190**	**251**		**128**	**190**	**251**
1 Txslot	26.2	26.31	26.02	-9.03dB	17.17	17.28	16.99
2 Txslots	25.04	24.75	24.62	-6.02dB	19.02	18.73	18.6
3 Txslots	22.74	22.86	23.13	-4.26dB	18.48	18.6	18.87
4 Txslots	21.98	22.1	21.82	-3.01dB	18.97	19.09	18.81
GSM 1900 8-PSK	Measured Power (dBm)			calculation	Averaged Power (dBm)		
	512	**661**	**810**		**512**	**661**	**810**
1 Txslot	26.71	26.9	26.71	-9.03dB	17.68	17.87	17.68
2 Txslots	25.72	25.77	25.78	-6.02dB	19.7	19.75	19.76
3 Txslots	24.12	23.99	23.76	-4.26dB	19.86	19.73	19.5
4 Txslots	22.99	23.03	22.84	-3.01dB	19.98	20.02	19.83

NOTES:

1) 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, the body measurements are performed with 2Txslots for 850MHz ; 4Txslots for1900MHz;

13.3. WCDMA Measurement result

Table 12.13: The conducted Power for WCDMA

Item	band	WCDMA BAND II result(dBm)		
	ARFCN	9262 (1852.4MHz)	9400 (1880.0MHz)	9538 (1907.6MHz)
WCDMA	\	22.36	22.21	22.12
HSDPA	1	21.44	21.43	21.4
	2	21.35	21.34	21.32
	3	20.95	20.96	20.98
	4	20.93	20.94	20.97
HSUPA	1	20.88	20.89	20.86
	2	21.41	21.43	21.44
	3	20.48	20.49	20.43
	4	21.44	21.43	21.49
	5	21.38	21.39	21.36
Item	band	WCDMA BAND V result(dBm)		
	ARFCN	Channel 4132 (826.4MHz)	Channel 4183 (836.6MHz)	Channel 4233 (846.6MHz)
WCDMA	\	22.47	22.49	22.58
HSDPA	1	21.63	21.64	21.59
	2	21.6	21.58	21.61
	3	21.21	21.24	21.23
	4	21.14	21.16	21.18
HSUPA	1	21.14	21.17	21.13
	2	21.66	21.67	21.68
	3	20.84	20.86	20.83
	4	21.67	21.69	21.7
	5	21.63	21.61	21.64

13.4. LTE Measurement result

Table 12.14: The conducted Power for LTE Band 7

LTE-FDD Band 7			Actual output Power (dBm)					
			High	Middle	Low	High	Middle	Low
RB allocation	RB offset (Start RB)	Modulation	5MHz			10MHz		
			21425	21100	20775	21400	21100	20800
1RB	High	QPSK	18.43	18.39	18.35	18.55	18.49	18.52
		16QAM	17.76	17.72	17.63	17.84	17.83	17.84
	Middle	QPSK	18.70	18.62	18.63	18.63	18.63	18.60
		16QAM	18.05	17.97	17.93	17.94	17.94	17.94
	Low	QPSK	18.42	18.35	18.43	18.49	18.47	18.48
		16QAM	17.76	17.68	17.74	17.76	17.77	17.83
50%RB	High	QPSK	17.64	17.60	17.58	17.78	17.73	17.73
		16QAM	16.64	16.62	16.58	16.75	16.70	16.67
	Middle	QPSK	17.70	17.65	17.66	17.73	17.69	17.72
		16QAM	16.71	16.64	16.63	16.69	16.66	16.66
	Low	QPSK	17.61	17.56	17.58	17.74	17.66	17.71
		16QAM	16.62	16.61	16.55	16.70	16.61	16.66
100%RB	/	QPSK	17.67	17.62	17.61	17.77	17.72	17.73
		16QAM	16.61	16.56	16.56	16.72	16.65	16.68
RB allocation	RB offset (Start RB)	Modulation	15MHz			20MHz		
			21375	21100	20825	21350	21100	20850
1RB	High	QPSK	18.52	18.47	18.42	18.32	18.26	18.28
		16QAM	17.81	17.78	17.75	17.59	17.65	17.60
	Middle	QPSK	18.54	18.52	18.54	18.61	18.62	18.60
		16QAM	17.81	17.86	17.81	17.85	17.97	17.96
	Low	QPSK	18.43	18.37	18.46	18.22	18.20	18.25
		16QAM	17.65	17.73	17.74	17.56	17.57	17.61
50%RB	High	QPSK	17.77	17.73	17.72	17.71	17.72	17.71
		16QAM	17.14	16.65	16.66	16.75	16.67	16.68
	Middle	QPSK	17.74	17.69	17.69	17.77	17.71	17.69
		16QAM	16.65	16.62	16.62	16.72	16.69	16.69
	Low	QPSK	17.70	17.64	17.65	17.66	17.60	17.58
		16QAM	16.59	16.58	16.60	16.61	16.55	16.54

100%RB	/	QPSK	17.77	17.69	17.70	17.74	17.63	17.66
		16QAM	16.66	16.59	16.60	16.66	16.60	16.60

13.5. WiFi and BT Measurement result

Table 12.15: The conducted power for Bluetooth

GFSK			
Channel	Ch0 (2402 MHz)	Ch39 (2441MHz)	CH78 (2480MHz)
Conducted Output Power (dBm)	6.65	7.81	6.77
π/4 DQPSK			
Channel	Ch0 (2402 MHz)	Ch39 (2441MHz)	CH78 (2480MHz)
Conducted Output Power (dBm)	5.41	6.52	5.42
8DPSK			
Channel	Ch0 (2402 MHz)	Ch39 (2441MHz)	CH78 (2480MHz)
Conducted Output Power (dBm)	5.41	6.49	5.42

Table 12.16: The conducted power for BLE

GFSK			
Channel	Ch0 (2402 MHz)	Ch19 (2440MHz)	CH39 (2480MHz)
Conducted Output Power (dBm)	6.7	7.8	6.8

NOTE: According to KDB447498 D01 BT standalone SAR are not required, because maximum average output power is less than 10mW.

Evaluation=1.987 ＜ 3.0

When the standalone SAR test exclusion is applied to an antenna that transmits simultaneously with other antennas, the standalone SAR must be estimated according to the following to determine simultaneous transmission SAR test exclusion:

$$SAR = \frac{P(Max. Power\ of\ channel, including\ tuneup\ tolerance, mW)}{D(Min. test\ separation\ distance,\ mm)} * \frac{\sqrt{frequency(GHz)}}{x}$$

Where

- D (Min, test separation distances, mm) is always set to 50 mm for Head SAR evaluation
- Frequency(GHz) is the center frequency in GHz
- where x = 7.5 for 1-g SAR, and x = 18.75 for 10-g SAR

Therefor

- SAR head value of BT is 0.265 W/Kg where D is set to 5mm
- SAR body value of BT is 0.132 W/Kg for 1g where D is set to 10mm

The default power measurement procedures are:

a) Power must be measured at each transmit antenna port according to the DSSS and OFDM transmission configurations in each standalone and aggregated frequency band.

b) Power measurement is required for the transmission mode configuration with the highest maximum output power specified for production units.

1) When the same highest maximum output power specification applies to multiple transmission modes, the largest channel bandwidth configuration with the lowest order modulation and lowest data rate is measured.

2) When the same highest maximum output power is specified for multiple largest channel bandwidth configurations with the same lowest order modulation or lowest order modulation and lowest data rate, power measurement is required for all equivalent 802.11 configurations with the same maximum output power.

c) For each transmission mode configuration, power must be measured for the highest and lowest channels; and at the mid-band channel(s) when there are at least 3 channels. For configurations with multiple mid-band channels, due to an even number of channels, both channels should be measured.

During WLAN SAR testing EUT is configured with the WLAN continuous TX tool, and the transmission duty factor was monitored on the spectrum analyzer with zero-span setting，the duty cycle is 100%.

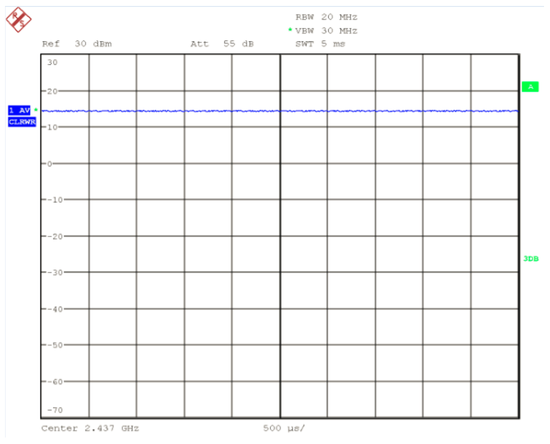
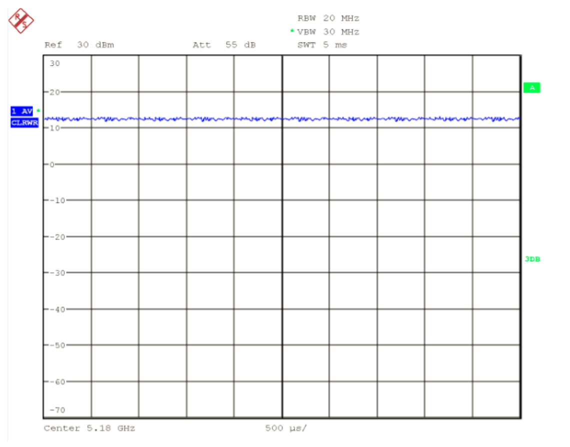
802.11b	802.11a
	

Table 12.17: The average conducted power for WiFi

Mode	Channel	Frequency	Average power(dBm)
802.11 b	1	2412 MHZ	19.32
	6	2437 MHZ	18.97
	11	2462 MHZ	19.02
802.11 g	1	2412 MHZ	16.13
	6	2437 MHZ	17.50
	11	2462 MHZ	15.95
802.11 n 20M	1	2412 MHZ	15.88
	6	2437 MHZ	16.97
	11	2462 MHZ	15.78
802.11 n 40M	3	2422 MHZ	14.09
	6	2437 MHZ	15.94
	9	2452 MHZ	13.96

Mode	Channel	Frequency MHz	Average Power (dBm)
802.11a	36	5180	13.22
	40	5200	13.18
	44	5220	13.02
	48	5240	13.66
	52	5260	13.49
	56	5280	12.40
	60	5300	13.23
	64	5320	13.22
	100	5500	12.27

	104	5520	12.64
	108	5540	12.17
	112	5560	12.71
	116	5580	12.18
	132	5660	11.89
	136	5680	12.10
	140	5700	11.53
	149	5745	11.75
	153	5765	11.75
	157	5785	11.58
	161	5805	11.92
	165	5825	12.17
802.11n 20M	36	5180	13.33
	40	5200	13.33
	44	5220	13.37
	48	5240	13.74
	52	5260	13.53
	56	5280	12.42
	60	5300	13.4
	64	5320	13.28
	100	5500	12.38
	104	5520	12.18
	108	5540	12.08
	112	5560	12.19
	116	5580	12.74
	132	5660	12.04
	136	5680	12.00
	140	5700	11.5
	149	5745	11.32
	153	5765	11.66
	157	5785	11.6
	161	5805	11.83
	165	5825	12.17
802.11n 40M	38	5190	13.53
	46	5230	13.93
	54	5270	13.85
	62	5310	13.67
	102	5510	12.78
	110	5550	12.13
	134	5670	12.17
	151	5755	12.26
	159	5795	12.16

2.4 GHz 802.11g/n OFDM SAR Test Exclusion Requirements

When SAR measurement is required for 2.4 GHz 802.11g/n OFDM configurations, the measurement and test reduction procedures for OFDM are applied. SAR is not required for the following 2.4 GHz OFDM conditions.

a) When KDB Publication 447498 D01 SAR test exclusion applies to the OFDM configuration.

b) 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.

5GHz 802.11a/n OFDM SAR Test Exclusion Requirements

For devices that operate in both U-NII-1 and U-NII-2A bands using the same transmitter and antenna(s), SAR test reduction is determined according to the following

1) When the same maximum output power is specified for both bands, begin SAR measurement in U-NII-2A band by applying the OFDM SAR requirements. If the highest reported SAR for a test configuration is ≤ 1.2 W/kg, SAR is not required for U-NII-1 band for that configuration (802.11 mode and exposure condition); otherwise, each band is tested independently for SAR.

2) When different maximum output power is specified for the bands, begin SAR measurement in the band with higher specified maximum output power. The highest reported SAR for the tested configuration is adjusted by the ratio of lower to higher specified maximum output power for the two bands. When the adjusted SAR is ≤ 1.2 W/kg, SAR is not required for the band with lower maximum output power in that test configuration; otherwise, each band is tested independently for SAR.

The highest reported SAR for Main Antenna is adjusted by the ratio of U-NII-1 to U-NII-2A specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg . So WiFi Antenna U-NII-1 mode is not required.

14. SAR Measurement Result

14.1. SAR Test Result For I19D00035-SAR01

Table 14.1: SAR Values(GSM 850 MHz Band-Head)

Frequency MHz	Frequency Ch.	Mode /Band	Side	Test Position	Figure No.	Measured average power (dBm)	Maximum allowed Power (dBm)	Scaling factor	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
836.6	190	GSM850	Left	Touch	1	32.58	33	1.102	0.167	0.184	0.02
836.6	190	GSM850	Left	Tilt	/	32.58	33	1.102	0.06	0.066	0.03
836.6	190	GSM850	Right	Touch	/	32.58	33	1.102	0.153	0.169	-0.07
836.6	190	GSM850	Right	Tilt	/	32.58	33	1.102	0.077	0.085	0.12

Table 14.2: SAR Values (GSM 850 MHz Band-Body)

Frequency MHz	Frequency Ch.	Mode /Band	Service /Headset	Test Position	Spacing (mm)	Figure No.	Measured average power (dBm)	Maximum allowed Power (dBm)	Scaling factor	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
Hotspot & Body worn												
836.6	190	GPRS 2TS	Class12	Toward Phantom	10	/	31.2	32	1.202	0.234	0.281	0.05
836.6	190	GPRS 2TS	Class12	Toward Ground	10	2	31.2	32	1.202	0.425	0.511	0.12
Hotspot												
836.6	190	GPRS 2TS	Class12	Toward Left	10	/	31.2	32	1.202	0.146	0.176	0.04
836.6	190	GPRS 2TS	Class12	Toward Right	10	/	31.2	32	1.202	0.091	0.109	0.13

836.6	190	GPRS 2TS	Class12	Toward Bottom	10	/	31.2	32	1.202	0.135	0.162	0.06

Table 14.3: SAR Values(GSM 1900 MHz Band-Head)

Frequency		Mode /Band	Side	Test Position	Figure No.	Measured average power (dBm)	Maximum allowed Power (dBm)	Scaling factor	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.										
1850.2	512	GSM1900	Left	Touch	/	29.86	30	1.033	0.297	0.307	0.14
1850.2	512	GSM1900	Left	Tilt	/	29.86	30	1.033	0.109	0.113	-0.06
1850.2	512	GSM1900	Right	Touch	3	29.86	30	1.033	0.339	0.350	-0.11
1850.2	512	GSM1900	Right	Tilt	/	29.86	30	1.033	0.0915	0.094	0.08

Table 14.4: SAR Values (GSM 1900 MHz Band-Body)

Frequency		Mode /Band	Service /Headset	Test Position	Spacing (mm)	Figure No.	Measured average power (dBm)	Maximum allowed Power (dBm)	Scaling factor	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.											
Hotspot & Body worn												
1850.2	512	GPRS 4TS	Class12	Toward Phantom	10	/	26.23	26.5	1.064	1.000	1.064	0.17
1909.8	810	GPRS 4TS	Class12	Toward Phantom	10	/	26.23	26.5	1.064	0.626	0.666	0.08
1880	661	GPRS 4TS	Class12	Toward Phantom	10	/	26.23	26.5	1.064	0.791	0.842	-0.02
1850.2	512	GPRS 4TS	Class12	Toward Ground	10	/	26.23	26.5	1.064	0.861	0.916	0.08
1909.8	810	GPRS 4TS	Class12	Toward Ground	10	/	26.01	26.5	1.119	0.903	1.011	0.07
1880	661	GPRS 4TS	Class12	Toward Ground	10	/	26.21	26.5	1.069	1.100	1.176	0.03

Hotspot												
1850.2	512	GPRS 4TS	Class12	Toward Left	10	/	26.23	26.5	1.064	0.791	0.842	-0.02
1850.2	512	GPRS 4TS	Class12	Toward Right	10	/	26.23	26.5	1.064	0.180	0.192	0.07
1850.2	512	GPRS 4TS	Class12	Toward Bottom	10	4	26.23	26.5	1.064	1.180	1.256	-0.03
1909.8	810	GPRS 4TS	Class12	Toward Bottom	10	/	26.01	26.5	1.119	0.820	0.918	0.07
1880	661	GPRS 4TS	Class12	Toward Bottom	10	/	26.21	26.5	1.069	0.642	0.686	0.05
Repeated												
1850.2	512	GPRS 4TS	Class12	Toward Bottom	10	/	26.23	26.5	1.064	1.080	1.149	-0.15

Table 14.5: SAR Values(WCDMA Band II-Head)

Frequency		Mode/Band	Side	Test Position	Figure No.	Measured average power (dBm)	Maximum allowed Power (dBm)	Scaling factor	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.										
1880	9400	Band II	Left	Touch	/	22.21	22.5	1.069	0.252	0.269	0.19
1880	9400	Band II	Left	Tilt	/	22.21	22.5	1.069	0.0711	0.076	-0.11
1880	9400	Band II	Right	Touch	5	22.21	22.5	1.069	0.329	0.352	0.14
1880	9400	Band II	Right	Tilt	/	22.21	22.5	1.069	0.0835	0.089	0.04

Table 14.6: SAR Values (WCDMA Band II-Body)

Frequency		Mode/Band	Service/Headset	Test Position	Spacing (mm)	Figure No.	Measured average power (dBm)	Maximum allowed Power (dBm)	Scaling factor	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.											

Hotspot & Body worn												
1880	9400	Band II	12.2kbps RMC	Toward Phantom	10	/	22.21	22.5	1.069	0.675	0.722	0.04
1880	9400	Band II	12.2kbps RMC	Toward Ground	10	/	22.21	22.5	1.069	0.506	0.541	0.10
Hotspot												
1880	9400	Band II	12.2kbps RMC	Toward Left	10	/	22.21	22.5	1.069	0.106	0.113	-0.01
1880	9400	Band II	12.2kbps RMC	Toward Right	10	/	22.21	22.5	1.069	0.175	0.187	0.10
1880	9400	Band II	12.2kbps RMC	Toward Bottom	10	/	22.21	22.5	1.069	0.814	0.870	0.00
1907.6	9538	Band II	12.2kbps RMC	Toward Bottom	10	/	22.12	22.5	1.091	0.832	0.908	0.05
1852.4	9262	Band II	12.2kbps RMC	Toward Bottom	10	/	22.36	22.5	1.033	0.880	0.909	0.09
Repeated												
1852.4	9262	Band II	12.2kbps RMC	Toward Bottom	10	6	22.36	22.5	1.033	0.918	0.948	0.09

Table 14.7: SAR Values(WCDMA Band V-Head)

Frequency MHz	Frequency Ch.	Mode /Band	Side	Test Position	Figure No.	Measured average power (dBm)	Maximum allowed Power (dBm)	Scaling factor	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
836.6	4183	Band V	Left	Touch	7	22.49	23	1.125	0.171	0.192	0.07
836.6	4183	Band V	Left	Tilt	/	22.49	23	1.125	0.0836	0.094	0.08
836.6	4183	Band V	Right	Touch	/	22.49	23	1.125	0.157	0.177	0.08.
836.6	4183	Band V	Right	Tilt	/	22.49	23	1.125	0.0706	0.079	0.09

Table 14.8: SAR Values (WCDMA Band V-Body)

Frequency MHz	Frequency Ch.	Mode /Band	Service /Headset	Test Position	Spacing (mm)	Figure No.	Measured average power (dBm)	Maximum allowed Power (dBm)	Scaling factor	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
Hotspot & Body worn												
836.6	4183	Band V	12.2kbps RMC	Toward Phantom	10	/	22.49	23	1.125	0.144	0.162	-0.02
836.6	4183	Band V	12.2kbps RMC	Toward Ground	10	/	22.49	23	1.125	0.231	0.260	0.02
846.6	4233	Band V	12.2kbps RMC	Toward Ground	10	8	22.40	23	1.148	0.257	0.295	-0.06
826.4	4132	Band V	12.2kbps RMC	Toward Ground	10	/	22.33	23	1.167	0.193	0.225	0.05
Hotspot												
836.6	4183	Band V	12.2kbps RMC	Toward Left	10	/	22.49	23	1.125	0.106	0.119	-0.03
836.6	4183	Band V	12.2kbps RMC	Toward Right	10	/	22.49	23	1.125	0.0643	0.072	0.10
836.6	4183	Band V	12.2kbps RMC	Toward Bottom	10	/	22.49	23	1.125	0.0702	0.079	0.13

Table 14.11: SAR Values (LTE Band 7 - Head)

Frequency MHz	Frequency Ch.	Configuration	Side	Test Position	Figure No.	Measured average power (dBm)	Maximum allowed Power (dBm)	Scaling factor	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
2535	21100	QPSK_20MHz_1RB_50 offset Middle	Left	Touch	/	18.62	19.5	1.225	0.096	0.118	0.03
2535	21100	QPSK_20MHz_1RB_50 offset Middle	Left	Tilt	/	18.62	19.5	1.225	0.064	0.078	0.07
2535	21100	QPSK_20MHz_1RB_50 offset Middle	Right	Touch	11	18.62	19.5	1.225	0.233	0.285	0.06
2535	21100	QPSK_20MHz_1RB_50 offset Middle	Right	Tilt	/	18.62	19.5	1.225	0.039	0.048	-0.15
2535	21100	QPSK_20MHz_50RB_50 offset Middle	Left	Touch	/	17.72	18.5	1.197	0.090	0.108	0.01
2535	21100	QPSK_20MHz_50RB_50 offset Middle	Left	Tilt	/	17.72	18.5	1.197	0.049	0.059	0.01
2535	21100	QPSK_20MHz_50RB_50 offset Middle	Right	Touch	/	17.72	18.5	1.197	0.181	0.217	0.02
2535	21100	QPSK_20MHz_50RB_25 offset Middle	Right	Tilt	/	17.72	18.5	1.197	0.030	0.036	0.03

Table 14.12: SAR Values (LTE Band 7 - Body)

Frequency		Configuration	Test Position	Spacing (mm)	Figure No.	Measured average power (dBm)	Maximum allowed Power (dBm)	Scaling factor	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.										
Hotspot & Body worn											
2535	21100	QPSK_20MHz_1RB_50 offset Middle	Toward Phantom	10	/	18.62	19.5	1.225	0.364	0.446	0.07
2535	21100	QPSK_20MHz_1RB_50 offset Middle	Toward Ground	10	/	18.62	19.5	1.225	0.660	0.808	0.18
2535	21100	QPSK_20MHz_50RB_50 offset Middle	Toward Phantom	10	/	17.72	18.5	1.197	0.282	0.337	0.16
2535	21100	QPSK_20MHz_50RB_50 offset Middle	Toward Ground	10	/	17.72	18.5	1.197	0.517	0.619	0.07
Hotspot											
2535	21100	QPSK_20MHz_1RB_50 offset Middle	Toward Left	10	/	18.62	19.5	1.225	0.054	0.066	0.13
2535	21100	QPSK_20MHz_1RB_50 offset Middle	Toward Right	10	/	18.62	19.5	1.225	0.090	0.110	-0.11
2535	21100	QPSK_20MHz_1RB_50 offset Middle	Toward Bottom	10	/	18.62	19.5	1.225	0.993	1.216	-0.07
2510	20850	QPSK_20MHz_1RB_50 offset Low	Toward Bottom	10	12	18.60	19.5	1.230	1.05	1.292	0.07
2560	21350	QPSK_20MHz_1RB_50 offset High	Toward Bottom	10	/	18.61	19.5	1.227	0.939	1.153	-0.06
2535	21100	QPSK_20MHz_50RB_50 offset Middle	Toward Left	10	/	17.72	18.5	1.197	0.042	0.050	-0.14
2535	21100	QPSK_20MHz_50RB_50 offset Middle	Toward Right	10	/	17.72	18.5	1.197	0.069	0.083	-0.07
2535	21100	QPSK_20MHz_50RB_50 offset Middle	Toward Bottom	10	/	17.72	18.5	1.197	0.776	0.929	0.11
2510	20850	QPSK_20MHz_50RB_50 offset Low	Toward Bottom	10	/	17.71	18.5	1.199	0.764	0.916	0.12
2560	21350	QPSK_20MHz_50RB_	Toward Bottom	10	/	17.71	18.5	1.199	0.821	0.985	0.14

		50 offset High									
253 5	**2110 0**	**QPSK_20MHz_100RB_ 0 offset Middle**	**Toward Bottom**	**10**	**/**	**17.63**	**18.5**	**1.222**	**0.828**	**1.012**	**0.09**
Repeated											
251 0	**2085 0**	**QPSK_20MHz_1RB_ 50 offset Low**	**Toward Bottom**	**10**	**/**	**18.60**	**19.5**	**1.230**	**1.05**	**1.292**	**0.09**

Table 14.13: SAR Values (WiFi 802.11b - Head)

Frequency		Mode /Band	Side	Test Position	Figure No.	Measured average power (dBm)	Maximum allowed Power (dBm)	Scaling factor	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.										
2412	1	WiFi 2450	Left	Touch	/	19.32	19.5	1.042	0.206	0.215	-0.18
2412	1	WiFi 2450	Left	Tilt	/	19.32	19.5	1.042	0.127	0.132	0.12
2412	1	WiFi 2450	Right	Touch	/	19.32	19.5	1.042	0.336	0.350	0.14
2412	1	WiFi 2450	Right	Tilt	/	19.32	19.5	1.042	0.208	0.217	0.15
2462	11	WiFi 2450	Right	Touch	13	19.02	19.5	1.117	0.364	0.407	0.12
2437	6	WiFi 2450	Right	Touch	/	18.97	19.5	1.130	0.348	0.393	0.03

Table 14.14: SAR Values (WiFi 802.11b - Body)

Frequency		Mode /Band	Service /Headset	Test Position	Spacing (mm)	Figure No.	Measured average power (dBm)	Maximum allowed Power (dBm)	Scaling factor	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.											
Hotspot & Body worn												
2412	1	WiFi 2450	802.11b	Toward Phantom	10	/	19.32	19.5	1.042	0.0546	0.057	0.04
2412	1	WiFi 2450	802.11b	Toward Ground	10	/	19.32	19.5	1.042	0.0758	0.079	0.01
2462	11	WiFi 2450	802.11b	Toward Ground	10	/	19.02	19.5	1.117	0.0848	0.095	0.12
2437	6	WiFi 2450	802.11b	Toward Ground	10	14	18.97	19.5	1.130	0.0968	0.109	0.03
Hotspot												
2412	1	WiFi 2450	802.11b	Toward Left	10	/	19.32	19.5	1.042	0.0420	0.044	0.01
2412	1	WiFi 2450	802.11b	Toward Right	10	/	19.32	19.5	1.042	0.00849	0.009	0.09
2412	1	WiFi 2450	802.11b	Toward Top	10	12	19.32	19.5	1.042	0.0368	0.038	-0.01

Table 14.15: SAR Values (WiFi 802.11n - Head)

Frequency		Mode /Band	Side	Test Position	Figure No.	Measured average power (dBm)	Maximum allowed Power (dBm)	Scaling factor	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.										
5270	54	WiFi U-NII-2A	Left	Touch	/	13.85	14	1.035	0.076	0.079	0.03
5270	54	WiFi U-NII-2A	Left	Tilt	/	13.85	14	1.035	0.073	0.076	0.01
5270	54	WiFi U-NII-2A	Right	Touch	15	13.85	14	1.035	0.212	0.219	0.03
5270	54	WiFi U-NII-2A	Right	Tilt	/	13.85	14	1.035	0.147	0.152	0.05

Table 14.16: SAR Values (WiFi 802.11n - Body)

Frequency MHz	Frequency Ch.	Mode /Band	Service /Headset	Test Position	Spacing (mm)	Figure No.	Measured average power (dBm)	Maximum allowed Power (dBm)	Scaling factor	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
Hotspot & Body worn												
5270	54	WiFi U-NII-2A	802.11n	Toward Phantom	10	/	13.85	14	1.035	0.09	0.093	-0.03
5270	54	WiFi U-NII-2A	802.11n	Toward Ground	10	/	13.85	14	1.035	0.087	0.090	0.03
Hotspot												
5270	54	WiFi U-NII-2A	802.11n	Toward Left	10	16	13.85	14	1.035	0.116	0.120	-0.01
5270	54	WiFi U-NII-2A	802.11n	Toward Right	10	/	13.85	14	1.035	<0.01	<0.01	0.01
5270	54	WiFi U-NII-2A	802.11n	Toward Top	10	/	13.85	14	1.035	0.044	0.046	-0.03

Table 14.17: SAR Values (WiFi 802.11n - Head)

Frequency MHz	Frequency Ch.	Mode /Band	Side	Test Position	Figure No.	Measured average power (dBm)	Maximum allowed Power (dBm)	Scaling factor	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
5510	102	WiFi U-NII-2C	Left	Touch	/	12.78	14	1.324	0.046	0.061	0.01
5510	102	WiFi U-NII-2C	Left	Tilt	/	12.78	14	1.324	0.038	0.050	0.02
5510	102	WiFi U-NII-2C	Right	Touch	17	12.78	14	1.324	0.12	0.159	0.04
5510	102	WiFi U-NII-2C	Right	Tilt	/	12.78	14	1.324	0.106	0.140	-0.03

Table 14.18: SAR Values (WiFi 802.11n - Body)

Frequency MHz	Frequency Ch.	Mode /Band	Service /Headset	Test Position	Spacing (mm)	Figure No.	Measured average power (dBm)	Maximum allowed Power (dBm)	Scaling factor	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
Hotspot & Body worn												
5510	102	WiFi U-NII-2C	802.11N	Toward Phantom	10	/	12.78	14	1.324	<0.01	<0.01	0.02
5510	102	WiFi U-NII-2C	802.11N	Toward Ground	10	/	12.78	14	1.324	0.03	0.040	-0.03
Hotspot												
5510	102	WiFi U-NII-2C	802.11N	Toward Left	10	18	12.78	14	1.324	0.04	0.053	0.01
5510	102	WiFi U-NII-2C	802.11N	Toward Right	10	/	12.78	14	1.324	<0.01	<0.01	0.03
5510	102	WiFi U-NII-2C	802.11N	Toward Top	10	/	12.78	14	1.324	0.009	0.012	0.01

Table 14.19: SAR Values (WiFi 802.11n - Head)

Frequency MHz	Frequency Ch.	Mode /Band	Side	Test Position	Figure No.	Measured average power (dBm)	Maximum allowed Power (dBm)	Scaling factor	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
5755	151	WiFi U-NII-3	Left	Touch	/	12.26	14	1.493	0.052	0.078	0.01
5755	151	WiFi U-NII-3	Left	Tilt	/	12.26	14	1.493	<0.01	<0.01	0.03
5755	151	WiFi U-NII-3	Right	Touch	19	12.26	14	1.493	0.077	0.115	0.01
5755	151	WiFi U-NII-3	Right	Tilt	/	12.26	14	1.493	0.070	0.105	0.01

Table 14.20: SAR Values (WiFi 802.11n - Body)

Frequency MHz	Frequency Ch.	Mode /Band	Service /Headset	Test Position	Spacing (mm)	Figure No.	Measured average power (dBm)	Maximum allowed Power (dBm)	Scaling factor	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
Hotspot & Body worn												
5755	151	WiFi U-NII-3	802.11N	Toward Phantom	10	/	12.26	14	1.493	<0.01	<0.01	-0.03
5755	151	WiFi U-NII-3	802.11N	Toward Ground	10	/	12.26	14	1.493	0.035	0.052	0.01
Hotspot												
5755	151	WiFi U-NII-3	802.11N	Toward Left	10	20	12.26	14	1.493	0.036	0.054	0.00
5755	151	WiFi U-NII-3	802.11N	Toward Right	10	/	12.26	14	1.493	<0.01	<0.01	0.05
5755	151	WiFi U-NII-3	802.11N	Toward Top	10	/	12.26	14	1.493	0.011	0.016	0.03

14.2. Standalone SAR Test Result For I20D00115-SAR01

Table 14.21: SAR Values for GSM 850

Test Position	Cover Type	Mode	Channel	Frequency (MHz)	Measured power (dBm)	Tune-up (dBm)	Power Drift (dB)	Limit of 1gSAR 1.6 W/kg (mW/g)			Figure No.
								Measured SAR1g	Scaling Factor	Report SAR1g	
Body SAR (HotSpot 10mm)											
Back Side	Standard	GPRS 2TS	190	836.6	31.2	32	-0.020	0.305	1.20	**0.367**	**1**

Table 14.22: SAR Values for GSM 1900

Test Position	Cover Type	Mode	Channel	Frequency (MHz)	Measured power (dBm)	Tune-up (dBm)	Power Drift (dB)	Limit of 1gSAR 1.6 W/kg (mW/g)			Figure No.
								Measured SAR1g	Scaling Factor	Report SAR1g	
Body SAR (HotSpot 10mm)											
Bottom Side	Standard	GPRS 4TS	512	1850.2	26.23	26.5	-0.050	1.190	1.06	**1.266**	**2**
Bottom Side	Standard	GPRS 4TS	661	1880	26.21	26.5	-0.080	1.160	1.07	1.240	/
Bottom Side	Standard	GPRS 4TS	810	1909.8	26.01	26.5	0.070	0.897	1.12	1.004	/
Body SAR (HotSpot 10mm)Repeated											
Bottom Side	Standard	GPRS 4TS	512	1850.2	26.23	26.5	-0.100	1.160	1.06	1.234	/

Table 14.23: SAR Values for WCDMA B2

Test Position	Cover Type	Mode	Channel	Frequency (MHz)	Measured power (dBm)	Tune-up (dBm)	Power Drift (dB)	Limit of 1gSAR 1.6 W/kg (mW/g)			Figure No.
								Measured SAR1g	Scaling Factor	Report SAR1g	
Body SAR (HotSpot 10mm)											
Bottom Side	Standard	RMC12.2k	9400	1880	22.21	22.5	-0.040	0.875	1.07	0.935	/
Bottom Side	Standard	RMC12.2k	9262	1852.4	22.36	22.5	-0.110	0.875	1.03	0.904	/
Bottom Side	Standard	RMC12.2k	9538	1907.6	22.12	22.5	-0.050	0.887	1.09	0.968	/
Body SAR (HotSpot 10mm)Repeated											
Bottom Side	Standard	RMC12.3k	9538	1907.6	22.12	22.5	0.000	0.906	1.09	**0.989**	**3**

Table 14.24: SAR Values for WCDMA B5

Test Position	Cover Type	Mode	Channel	Frequency (MHz)	Measured power (dBm)	Tune-up (dBm)	Power Drift (dB)	Limit of 1gSAR 1.6 W/kg (mW/g)			Figure No.
								Measured SAR1g	Scaling Factor	Report SAR1g	
Body SAR (HotSpot 10mm)											
Back Side	Standard	RMC12.2k	4233	846.6	22.4	23	-0.070	0.268	1.15	**0.308**	**4**

Table 14.25: SAR Values for LTE B7

Test Position	Cover Type	Mode				Channel	Frequency (MHz)	Measured power (dBm)	Tune-up (dBm)	Power Drift (dB)	Limit of 1gSAR 1.6 W/kg (mW/g)			Figure No.
		Modulation	BW(MHz)	RB Allocation	RB Offset						Measured SAR1g	Scaling Factor	Report SAR1g	
Body SAR (HotSpot 10mm)														
Bottom Side	Standard	QPSK	20	1	mid	20850	2510	18.6	19.5	-0.08	1.100	1.23	**1.353**	**5**
Bottom Side	Standard	QPSK	20	1	mid	21100	2535	18.62	19.5	0.01	1.070	1.22	1.310	/
Bottom Side	Standard	QPSK	20	1	mid	21350	2560	18.61	19.5	-0.07	0.990	1.23	1.215	/
Body SAR (HotSpot 10mm)Repeated														
Bottom Side	Standard	QPSK	20	1	mid	20850	2510	18.6	19.5	-0.01	1.100	1.23	1.353	/

Table 14.26: SAR Values for WiFi 2.4G

Test Position	Cover Type	Mode	BW(MHz)	Duty Cycle	Channel	Frequency (MHz)	Measured power (dBm)	Tune-up (dBm)	Power Drift (dB)	Limit of 1gSAR 1.6 W/kg (mW/g)			Figure No.
										Measured SAR1g	Scaling Factor	Report SAR1g	
Head SAR													
Right Touch	Standard	802.11b	20	1:1	11	2462	19.02	19.5	0.020	0.416	1.12	**0.465**	**6**

Table 14.27: SAR Values for WiFi 5G

Test Position	Cover Type	Mode	BW(MHz)	Duty Cycle	Channel	Frequency (MHz)	Measured power (dBm)	Tune-up (dBm)	Power Drift (dB)	Limit of 1gSAR 1.6 W/kg (mW/g)			Figure No.
										Measured SAR1g	Scaling Factor	Report SAR1g	
Head SAR													
Right Touch	Standard	802.11n	20	1:1	54	5270	13.85	14	0.010	0.163	1.04	0.169	**/**
Right Touch	Standard	802.11n	20	1:1	102	5510	12.78	14	0.000	0.118	1.32	0.156	**/**
Right Touch	Standard	802.11n	20	1:1	151	5755	12.26	14	0.010	0.171	1.49	**0.255**	**7**

14.3. Simultaneous SAR Evaluation

Table 14.28: Simultaneous transmission SAR

Standalone SAR for 2G(W/Kg)					
Test Position			GSM 850	GSM 1900	Highest SAR
Head	Left	Cheek	0.184	0.307	0.307
		Tilt 15°	0.066	0.113	0.113
	Right	Cheek	0.169	0.35	0.35
		Tilt 15°	0.085	0.094	0.094
Hotspot &Body- worn 10 mm	Phantom Side		0.281	1.064	1.064
	Ground Side		0.367	1.176	1.176
Hotspot 10 mm	Left Side		0.176	0.842	0.842
	Right Side		0.109	0.192	0.192
	Top Side		--	--	--
	Bottom Side		0.162	1.266	1.266

Standalone SAR for 3G(W/Kg)					
Test Position			WCDMA Band II	WCDMA BandV	Highest SAR
Head	Left	Cheek	0.269	0.192	0.269
		Tilt 15°	0.076	0.094	0.094
	Right	Cheek	0.352	0.177	0.352
		Tilt 15°	0.089	0.079	0.089
Hotspot &Body- worn 10 mm	Phantom Side		0.722	0.162	0.722
	Ground Side		0.541	0.308	0.541
Hotspot 10 mm	Left Side		0.113	0.119	0.119
	Right Side		0.187	0.072	0.187
	Top Side		--	--	--
	Bottom Side		0.989	0.079	0.989

Standalone SAR for 4G (W/Kg)				
Test Position			LTE Band 7	Highest SAR
Head	Left	Cheek	0.118	0.118
		Tilt 15°	0.078	0.078
	Right	Cheek	0.285	0.285
		Tilt 15°	0.048	0.048
Hotspot &Body- worn 10 mm	Phantom Side		0.446	0.446
	Ground Side		0.808	0.808
Hotspot 10 mm	Left Side		0.066	0.066
	Right Side		0.11	0.11
	Top Side		--	--

	Bottom Side	1.353	1.353

Simultaneous multi-band transmission									
Test Position			2G	3G	4G	2.4GHz		5GHz	SUM
						BT	WiFi	WiFi	
Head(1g)	Left	Cheek	0.307	0.269	0.118	0.265	0.215	0.079	0.572
		Tilt 15°	0.113	0.094	0.078	0.265	0.132	0.076	0.378
	Right	Cheek	0.35	0.352	0.285	0.265	0.465	0.255	0.817
		Tilt 15°	0.094	0.089	0.048	0.265	0.217	0.152	0.359
Hotspot &Body- worn 10 mm(1g)	Phantom Side		1.064	0.722	0.446	0.132	0.057	0.093	1.196
	Ground Side		1.176	0.541	0.808	0.132	0.109	0.09	1.308
Hotspot 10 mm(1g)	Left Side		0.842	0.119	0.066	0.132	0.044	0.12	0.974
	Right Side		0.192	0.187	0.11	0.132	0.009	0.01	0.324
	Top Side		0	0	--	0.132	0.038	0.046	0.132
	Bottom Side		1.266	0.989	1.353	--	--	--	1.353

According to the conducted power measurement result, we can draw the conclusion that: stand-alone SAR for WiFi should be performed. Then, simultaneous transmission SAR for WiFi/BT is considered with measurement results of GSM/WCDMA/LTE/CDMA and WiFi/BT. According to the above table, the sum of reported SAR values for GSM/WCDMA/LTECDMA and WiFi<1.6W/kg. So the simultaneous transmission SAR is not required for WiFi/BT transmitter.

14.4. 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 head and body tissue-equivalent media are 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; steps2) 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 ≥ 1.45W/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.

Table 14.29: SAR Measurement Variability (1g)

Frequency		Configuration	Test Position	Original SAR (W/kg)	First Repeated SAR (W/kg)	The Ratio
MHz	Ch.					
1850.2	512	GPRS 1900 4TS	Bottom	1.19	1.16	1.03
1907.6	9538	RMC12.2K	Bottom	0.887	0.906	1.02
2510	20850	QPSK_20MHz_1RB_50 offset Low	Bottom	1.1	1.1	1.000

Note: According to the KDB 865664 D01 repeated measurement is not required when the original highest measured SAR is < 0.8 W/kg.

15. Test Equipment Utilized

Table 15.1 SAR Test System Equipment List

Item	Instrument Name	Type	Serial Number	Manufacturer	Cal. Date	Cal. interval
1	Network analyzer	N5242A	MY51221755	Agilent	2019-12-11	1 year
2	Power meter	NRVD	102257	RS	2020-5-10	1 year
3	Power sensor	NRV-Z5	100241			
			100644			
4	Signal Generator	E4438C	MY49072044	Agilent	2020-5-10	1 Year
5	Amplifier	NTWPA-0086010F	12023024	rflight	No Calibration Requested	
6	Coupler	778D	MY4825551	Agilent	2020-5-10	1 year
7	BTS	E5515C	MY50266468	Agilent	2019-12-11	1 year
		MT8820C	6201240338	Anritsu	2019-12-11	1 year
8	E-field Probe	EX3DV4	7401	SPEAG	2020-4-1	1 year
9	DAE	SPEAG DAE4	1581	SPEAG	2020-5-6	1 year
10	Dipole Validation Kit	SPEAG D2600V2	1031	SPEAG	2018-11-1	3 year
		SPEAG D835V2	4d112	SPEAG	2018-10-25	3 year
		SPEAG D1900V2	5d232	SPEAG	2020-02-12	3 year
		SPEAG D2450V2	858	SPEAG	2018-10-26	3 year
		SPEAG D5GHzV2	1172	SPEAG	2018-3-30	3 year

16. Measurement Uncertainty

Table 16.1 Measurement Uncertainty Evaluation for SAR test

Error Description	Uncert. Value	Prob. Dist.	Div.	(Ci) 1g	(Ci) 10g	Std. Unc.[%] (1g)	Std. Unc.[%] (10g)	(Ui) ueff
Measurement System								
Probe Calibration	13.3	N	2	1	1	6.65	6.65	∞
Axial Isotropy	4.7	R	$\sqrt{3}$	0.7	0.7	1.90	1.90	∞
Hemispherical Isotropy	9.6	R	$\sqrt{3}$	0.7	0.7	3.88	3.88	∞
Boundary effects	1	R	$\sqrt{3}$	1	1	0.58	0.58	∞
Linearity	4.7	R	$\sqrt{3}$	1	1	2.70	2.70	∞
System Detection Limits	1	R	$\sqrt{3}$	1	1	0.58	0.58	∞
Readout Electronics	0.7	N	1	1	1	0.70	0.70	∞
Response Time	0.8	R	$\sqrt{3}$	1	1	0.50	0.50	∞
Integration Time	2.6	R	$\sqrt{3}$	1	1	1.50	1.50	∞
RF Ambient Noise	3	R	$\sqrt{3}$	1	1	1.70	1.70	∞
RF Ambient Re ections	3	R	$\sqrt{3}$	1	1	1.70	1.70	∞
Probe Positioner	0.4	R	$\sqrt{3}$	1	1	0.20	0.20	∞
Probe Positioning	2.9	R	$\sqrt{3}$	1	1	1.70	1.70	∞
Post-processing	4	R	$\sqrt{3}$	1	1	2.30	2.30	∞
Test Sample Related								
Device Holder	2.55	N	1	1	1	2.55	2.55	71
Test dample Positioning	1.34	N	1	1	1	1.34	1.34	3
Power Drift	5	R	$\sqrt{3}$	1	1	2.9	2.9	∞
Phantom and Setup								
Phantom Uncertainty	4	R	$\sqrt{3}$	1	1	2.3	2.3	∞
Liquid Conductivity (target)	5	R	$\sqrt{3}$	0.64	0.43	2.9	2.9	∞
Liquid Conductivity (meas.)	5	N	1	0.64	0.43	5	5	∞
Liquid Permittivity (target)	5	R	$\sqrt{3}$	0.6	0.49	2.9	2.9	∞
Liquid Permittivity (meas.)	5	N	1	0.6	0.49	5	5	∞
Combined Std. Uncertainty	$U_C^{'} = \sqrt{\sum_{i=1}^{23} Ci^2 Ui^2}$					11.23	10.70	
Expanded STD Uncertainty	$U_C = 2U_C^{'}$					22.45	21.40	

Table 16.2 Measurement Uncertainty Evaluation for System Validation

Error Description	Uncert. Value	Prob. Dist.	Div.	(Ci) 1g	(Ci) 10g	Std. Unc.[%] (1g)	Std. Unc.[%] (10g)	(Ui) ueff
Measurement System								
Probe Calibration	13.3	N	2	1	1	6.65	6.65	∞
Axial Isotropy	4.7	R	$\sqrt{3}$	0.7	0.7	1.90	1.90	∞
Hemispherical Isotropy	9.6	R	$\sqrt{3}$	0.7	0.7	3.88	3.88	∞
Boundary effects	1	R	$\sqrt{3}$	1	1	0.58	0.58	∞
Linearity	4.7	R	$\sqrt{3}$	1	1	2.70	2.70	∞
System Detection Limits	1	R	$\sqrt{3}$	1	1	0.58	0.58	∞
Readout Electronics	0.7	N	1	1	1	0.70	0.70	∞
Response Time	0.8	R	$\sqrt{3}$	1	1	0.50	0.50	∞
Integration Time	2.6	R	$\sqrt{3}$	1	1	1.50	1.50	∞
RF Ambient Noise	3	R	$\sqrt{3}$	1	1	1.70	1.70	∞
RF Ambient Re ections	3	R	$\sqrt{3}$	1	1	1.70	1.70	∞
Probe Positioner	0.4	R	$\sqrt{3}$	1	1	0.20	0.20	∞
Probe Positioning	2.9	R	$\sqrt{3}$	1	1	1.70	1.70	∞
Post-processing	4	R	$\sqrt{3}$	1	1	2.30	2.30	∞
Test Sample Related								
Validation Dipole Positioning	2	N	1	1	1	2	2	
Dipole Input Power	5	N	1	1	1	5	5	
Power Drift	5	R	$\sqrt{3}$	1	1	2.9	2.9	∞
Phantom and Setup								
Phantom Uncertainty	4	R	$\sqrt{3}$	1	1	2.3	2.3	∞
Liquid Conductivity (target)	5	R	$\sqrt{3}$	0.64	0.43	2.9	2.9	∞
Liquid Conductivity (meas.)	5	N	1	0.64	0.43	5	5	∞
Liquid Permittivity (target)	5	R	$\sqrt{3}$	0.6	0.49	2.9	2.9	∞
Liquid Permittivity (meas.)	5	N	1	0.6	0.49	5	5	∞
Combined Std. Uncertainty	$U_C' = \sqrt{\sum_{i=1}^{23} Ci^2 Ui^2}$					12.11	11.63	
Expanded STD Uncertainty	$U_C = 2U_C'$					24.23	23.26	

END OF REPORT BODY

ANNEX A. Graph Results

Fig.1 GPRS850 2TS Ground Mode Middle

Date/Time: 2020/9/11
Electronics: DAE4 Sn1581
Medium parameters used: f = 837 MHz; σ = 0.933 S/m; ε_r = 42.561; ρ = 1000 kg/m^3
Ambient Temperature:22.6°C Liquid Temperature:22.6°C
Communication System: GSM 2600MHz GPRS 2TS (0); Frequency: 836.6 MHz; Duty Cycle: 1:4
Probe: EX3DV4 - SN7401ConvF(10.22, 10.22, 10.22) @ 836.6 MHz
GPRS850 4TS Ground Mode Middle /Area Scan (61x101x1):
Measurement grid: dx=10 mm, dy=10 mm
Maximum value of SAR (Measurement) = 0.470 W/kg
GPRS850 4TS Ground Mode Middle /Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 17.11 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 0.583 W/kg
SAR(1 g) = 0.305 W/kg; SAR(10 g) = 0.189 W/kg
Maximum of SAR (measured) = 0.466 W/kg

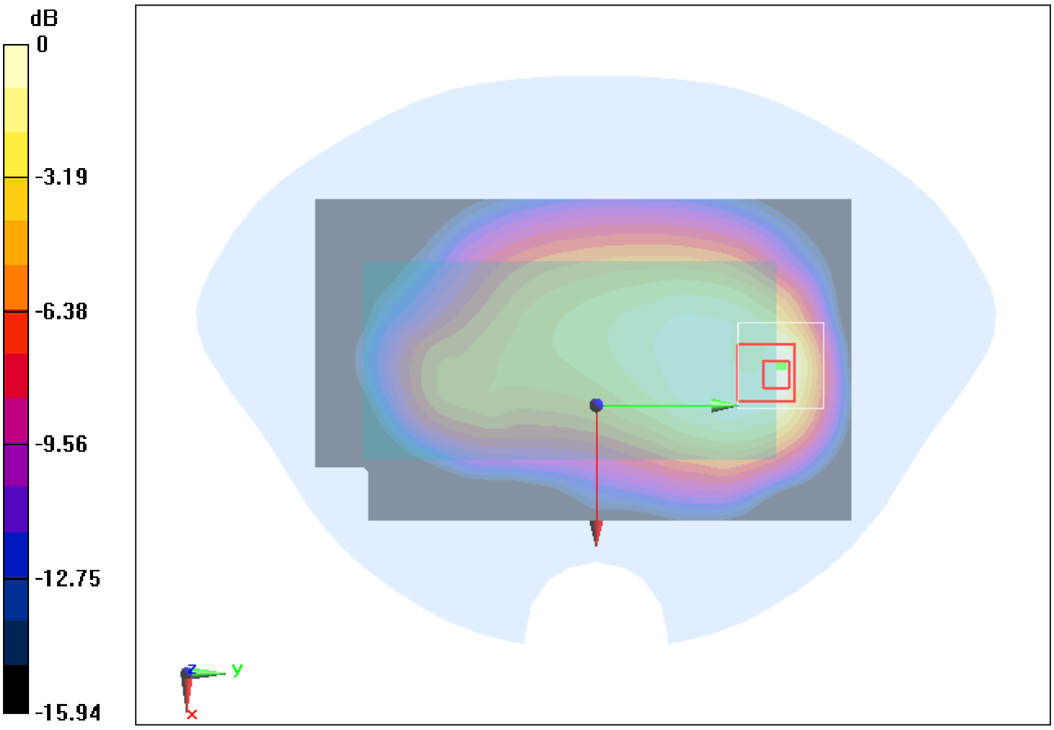


Fig.2 GPRS1900 4TS Bottom Mode Low

Date/Time: 2020/9/11
Electronics: DAE4 Sn1581
Medium parameters used (interpolated): f = 1850.2 MHz; σ = 1.422 S/m; ε_r = 39.072; ρ = 1000 kg/m^3
Ambient Temperature:22.6°C Liquid Temperature:22.6°C
Communication System: GPRS1900 4TS 2600MHz; Frequency: 1850.2 MHz; Duty Cycle: 1:2
Probe: EX3DV4 - SN7401ConvF(8.37, 8.37, 8.37) @ 1850.2 MHz
GPRS1900 4TS Bottom Mode Low 2/Area Scan (51x81x1):
Measurement grid: dx=10 mm, dy=10 mm
Maximum value of SAR (Measurement) = 1.72 W/kg
GPRS1900 4TS Bottom Mode Low 2/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 37.12 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 2.17 W/kg
SAR(1 g) = 1.19 W/kg; SAR(10 g) = 0.628 W/kg
Maximum value of SAR (measured) = 1.83 W/kg

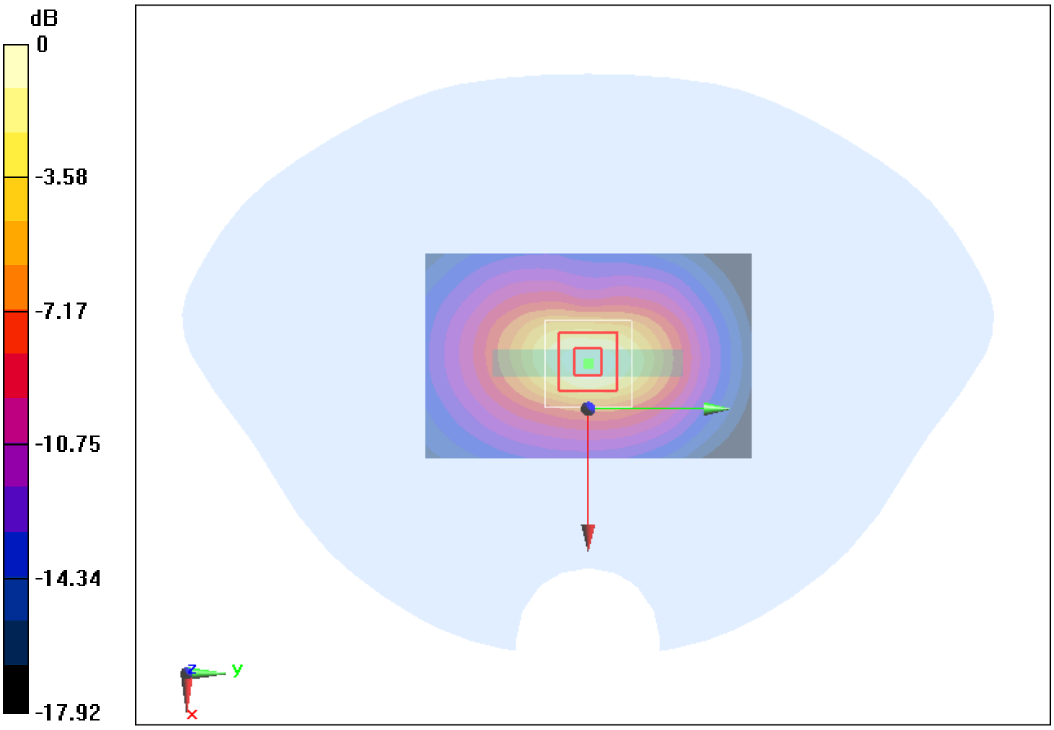


Fig.3 WCDMA B2 Bottom Mode High Repeated

Date/Time: 2020/9/11
Electronics: DAE4 Sn1581
Medium parameters used (interpolated): f = 1907.6 MHz; σ = 1.454 S/m; ε_r = 38.974; ρ = 1000 kg/m^3
Ambient Temperature:22.6°C Liquid Temperature:22.6°C
Communication System: WCDMA 2600MHz; Frequency: 1907.6 MHz; Duty Cycle: 1:1
Probe: EX3DV4 - SN7401ConvF(8.37, 8.37, 8.37) @ 1907.6 MHz

WCDMA B2 Bottom Mode High Repeated/Area Scan (51x81x1):
Measurement grid: dx=10 mm, dy=10 mm
Maximum value of SAR (Measurement) = 1.40 W/kg

WCDMA B2 Bottom Mode High Repeated/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 30.58 V/m; Power Drift = -0.00 dB
Peak SAR (extrapolated) = 1.71 W/kg
SAR(1 g) = 0.906 W/kg; SAR(10 g) = 0.473 W/kg
Maximum value of SAR (measured) = 1.41 W/kg

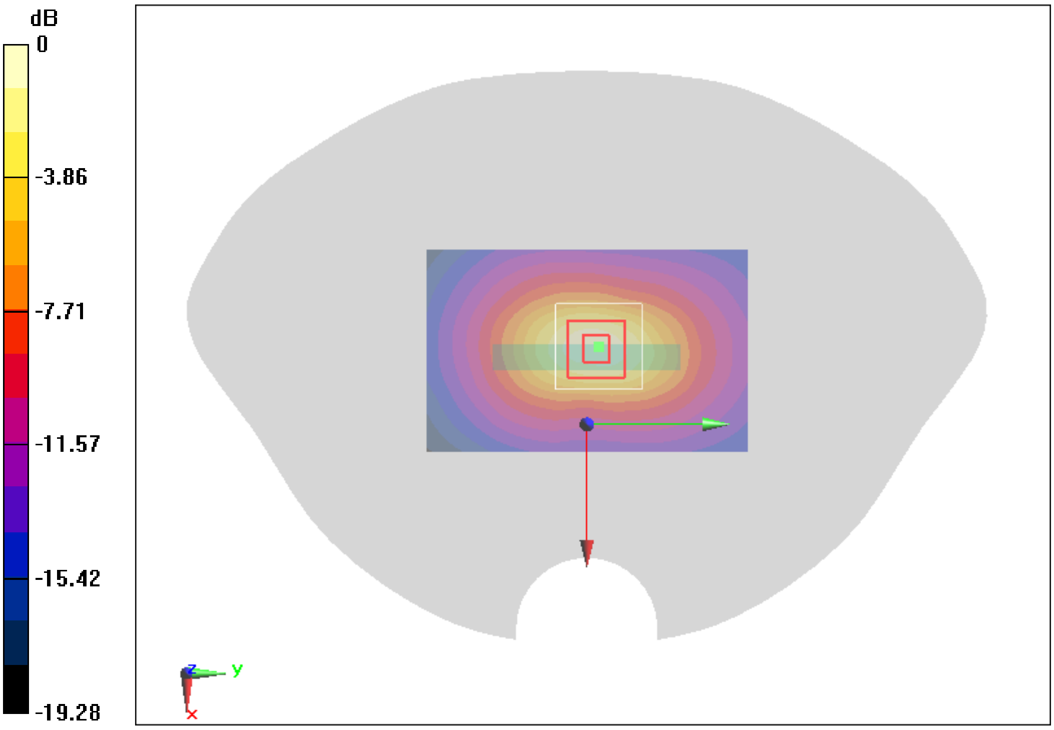


Fig.4 WCDMA Band 5 Ground Mode High

Date/Time: 2020/9/11
Electronics: DAE4 Sn1581
Medium parameters used: f = 847 MHz; σ = 0.941 S/m; ε_r = 42.459; ρ = 1000 kg/m^3
Ambient Temperature:22.6°C Liquid Temperature:22.6°C
Communication System: WCDMA 2600MHz; Frequency: 846.6 MHz; Duty Cycle: 1:1
Probe: EX3DV4 - SN7401ConvF(10.22, 10.22, 10.22) @ 846.6 MHz
WCDMA Band 5 Ground Mode High 10mm 2/Area Scan (61x101x1):
Measurement grid: dx=10 mm, dy=10 mm
Maximum value of SAR (Measurement) = 0.523 W/kg
WCDMA Band 5 Ground Mode High 10mm 2/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 16.08 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 0.536 W/kg
SAR(1 g) = 0.268 W/kg; SAR(10 g) = 0.167 W/kg
Maximum of SAR (measured) = 0.387 W/kg

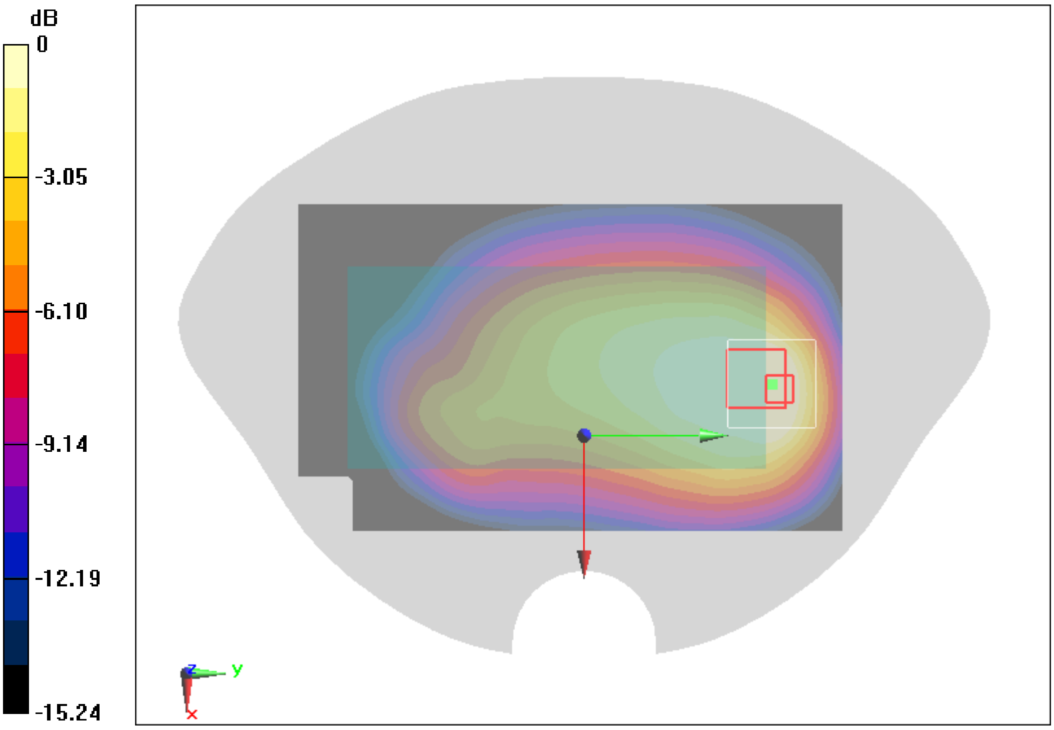


Fig.5 LTE B7 20M 1RB 50offset Bottom Mode Low

Date/Time: 2020/8/20
Electronics: DAE4 Sn1581
Medium parameters used (interpolated): f = 2510 MHz; σ = 1.856 S/m; ε_r = 38.202; ρ = 1000 kg/m^3
Ambient Temperature:22.6°C Liquid Temperature:22.6°C
Communication System: LTE B7 2600MHz; Frequency: 2510 MHz; Duty Cycle: 1:1
Probe: EX3DV4 - SN7401ConvF(7.85, 7.85, 7.85) @ 2510 MHz
LTE B7 20M 1RB 50offset Bottom Mode Low 0820/Area Scan (51x81x1):
Measurement grid: dx=10 mm, dy=10 mm
Maximum value of SAR (Measurement) = 1.77 W/kg
LTE B7 20M 1RB 50offset Bottom Mode Low 0820/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 33.36 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 2.19 W/kg
SAR(1 g) = 1.1 W/kg; SAR(10 g) = 0.533 W/kg
Maximum value of SAR (measured) = 1.76 W/kg

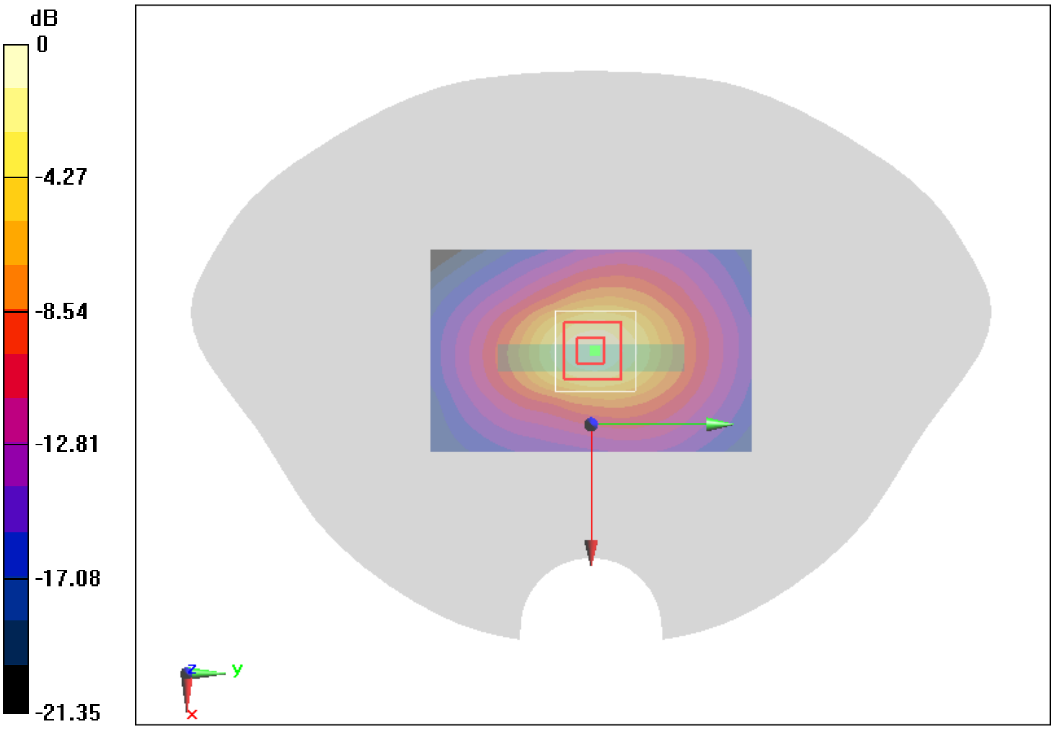


Fig.6 Wifi 2.4G Right Cheek High

Date/Time: 2020/9/14
Electronics: DAE4 Sn1581
Medium parameters used (interpolated): f = 2462 MHz; σ = 1.82 S/m; ε_r = 38.287; ρ = 1000 kg/m^3
Ambient Temperature:22.6°C   Liquid Temperature:22.6°C
Communication System: Wifi 2450 2600MHz; Frequency: 2462 MHz; Duty Cycle: 1:1
Probe: EX3DV4 - SN7401ConvF(7.85, 7.85, 7.85) @ 2462 MHz
wifi 2.4G Right Cheek High/Area Scan (101x51x1):
Measurement grid: dx=10 mm, dy=10 mm
Maximum value of SAR (Measurement) = 0.601 W/kg
wifi 2.4G Right Cheek High/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 9.249 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 0.986 W/kg
SAR(1 g) = 0.416 W/kg; SAR(10 g) = 0.195 W/kg
Maximum value of SAR (measured) = 0.442 W/kg

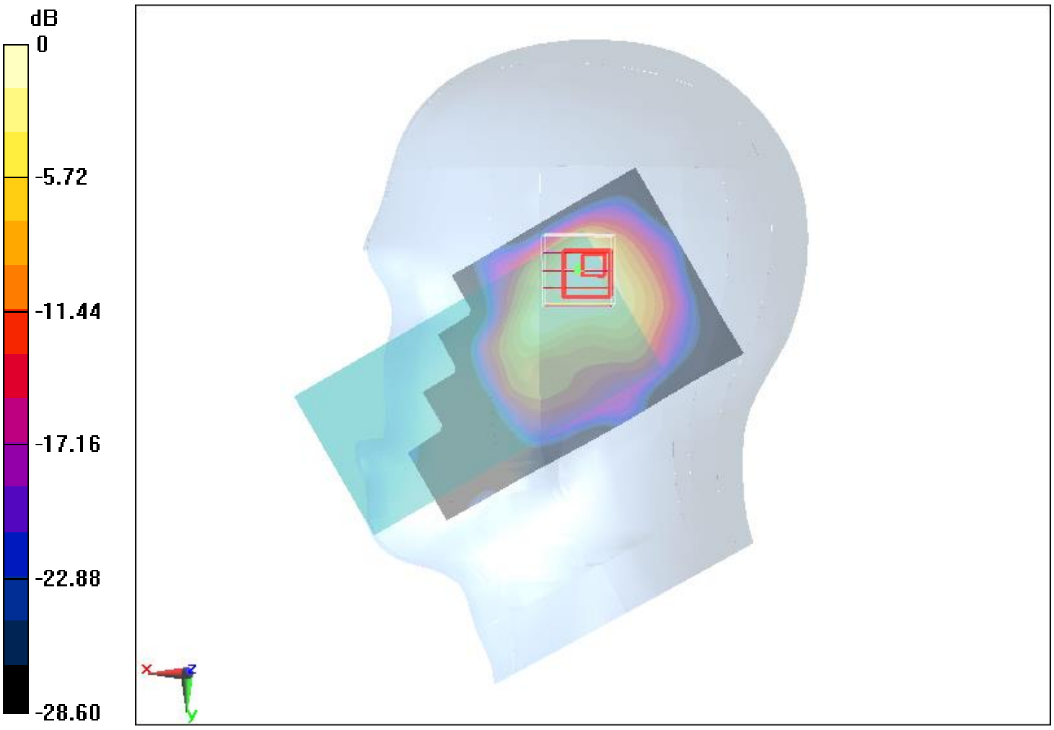


Fig.7 Wifi 5G U-NII-3 Right Cheek High

Date/Time: 2020/9/14
Electronics: DAE4 Sn1581
Medium parameters used: f = 5755 MHz; σ = 5.177 S/m; ε_r = 36.172; ρ = 1000 kg/m^3
Ambient Temperature:22.6°C Liquid Temperature:22.6°C
Communication System: 5GHz U-NII-3 5GHz; Frequency: 5755 MHz; Duty Cycle: 1:1
Probe: EX3DV4 - SN7401ConvF(5.22, 5.22, 5.22) @ 5755 MHz
wifi 5G U-NII-3 Right Cheek Middle/Area Scan (131x71x1):
Measurement grid: dx=10 mm, dy=10 mm
Maximum value of SAR (Measurement) = 0.110 W/kg
wifi 5G U-NII-3 Right Cheek Middle/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 0.3170 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 0.689 W/kg
SAR(1 g) = 0.171 W/kg; SAR(10 g) = 0.048 W/kg
Maximum of SAR (measured) = 0.190 W/kg