REPORT No. : SZ15090021S01

FCC SAR TEST REPORT

APPLICANT	:	Observa Telecom
PRODUCT NAME	:	LTE Cat 4 USB Dongle
MODEL NAME	:	QX610C
TRADE NAME	:	QX610C
BRAND NAME	:	Observa Mobile
FCC ID	:	2AFTXQX610C
STANDARD(S)	:	47CFR 2.1093 IEEE 1528-2013
ISSUE DATE	:	2015-10-08

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DIRECTORY

Change History		
Issue	Date	Reason for change
1.0	2015-10-08	First edition

TEST REPORT DECLARATION

Applicant	Observa Telecom		
Applicant Address	c/ Monte Esquinza, 28 1ºDrcha Madrid P.C.28010 SPAIN		
Manufacturer	Observa Telecom		
Manufacturer Address	c/ Monte Esquinza, 28 1ºDrcha Madrid P.C.28010 SPAIN		
Product Name	LTE Cat 4 USB Dongle		
Model Name	QX610C		
Brand Name	Observa Mobile		
HW Version	1.0		
SW Version	1.0		
Test Standards	47CFR 2.1093; IEEE 1528-2013		
Test Date	2015-09-16 to 2015-09-17		
The Highest Reported 1g-SAR(W/kg)	Body	1.146W/kg	Limit(W/kg): 1.6W/kg

Tested by : Liu Jun
Liu Jun

Reviewed by : Zhu Zhan
Zhu Zhan

Approved by : Zeng Dexin
Zeng Dexin

1.TECHNICAL INFORMATION

Note: the Following data is based on the information by the applicant.

1.1 Identification of Applicant

Company Name:	Observa Telecom
Address:	c/ Monte Esquinza, 28 1ºDrcha Madrid P.C.28010 SPAIN

1.2 Identification of Manufacturer

Company Name:	Observa Telecom
Address:	c/ Monte Esquinza, 28 1ºDrcha Madrid P.C.28010 SPAIN

1.3 Equipment Under Test (EUT)

Model Name:	QX610C
Trade Name:	QX610C
Brand Name:	Observa Mobile
Hardware Version:	1.0
Software Version:	1.0
Tx Frequency Bands:	GSM 850: 824-849 MHz; GSM 1900: 1850-1910 MHz; WCDMA Band II : 1850-1910MHz; WCDMA Band IV :1710-1755MHz; WCDMA Band V: 824-849 MHz; LTE Band 2: 1850-1910MHz;LTE Band 7: 2500-2570MHz;
Uplink Modulations:	GSM/GPRS: GSMK; EDGE: GMSK/8PSK; WCDMA/HSDPA/HSUPA/HSPA+:QPSK; FDD-LTE:QPSK/16QAM;
Multislot Class:	GPRS: Class 33; EDGE: Class 33;
GPRS Class:	Class B
DTM:	Not support
Antenna type:	Fixed Internal Antenna
Development Stage:	Identical prototype

1.3.1 Photographs of the EUT

Please refer to the External Photos for the Photos of the EUT

1.3.2 Identification of all used EUT

The EUT identity consists of numerical and letter characters, the letter character indicates the test sample, and the Following two numerical characters indicate the software version of the test sample.

EUT Identity	Hardware Version	Software Version
1#	1.0	1.0

1.4 Applied Reference Documents

Leading reference documents for testing:

No.	Identity	Document Title
1	**47 CFR§2.1093**	Radiofrequency Radiation Exposure Evaluation: Portable Devices
2	**IEEE 1528-2013**	IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques
3	**KDB 447498 D02v02**	SAR Procedures for Dongle Xmtr
4	**KDB 941225 D01v03**	SAR Measurement Procedures for 3G Devices
5	**KDB 941225 D02v02r02**	HSPA and 1x Advanced
6	**KDB 941225 D03v01**	SAR Test Reduction GSM GPRS EDGE
7	**KDB 941225 D04v01**	SAR for GSM E GPRS Dual Xfer Mode
8	**KDB941225 D05v02r03**	SAR for LTE Devices
9	**KDB 865664 D01v01r04**	SAR Measurement 100 MHz to 6 GHz
10	**KDB 865664 D02v01r01**	SAR Reporting

1.5 Device Category and SAR Limits

Uncontrolled Environment

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

Controlled Environment

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

Limits for Occupational/Controlled Exposure (W/kg)

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

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

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

Note: This device belongs to portable device category because its radiating structure is allowed to be used within 20 centimeters of the body of the user. Limit for General Population/Uncontrolled exposure should be applied for this device, it is 1.6 W/kg as averaged over any 1 gram of tissue.

2. SPECIFIC ABSORPTION RATE (SAR)

2.1 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 Middle than the limits for general population/uncontrolled.

2.2 SAR Definition

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

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

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

$$\mathbf{SAR} = \mathbf{C}\left(\frac{\boldsymbol{\delta}\mathbf{T}}{\boldsymbol{\delta}\mathbf{t}}\right)$$

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

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

Where σ is the conductivity of the tissue, ρ is the mass density of the tissue and $|E|$ is the rms electrical field strength.

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

3. SAR MEASUREMENT SETUP

3.1 The Measurement System

Comosar is a system that is able to determine the SAR distribution inside a phantom of human being according to different standards. The Comosar system consists of the Following items:

- Main computer to control all the system
- 6 axis robot
- Data acquisition system
- Miniature E-field probe
- Phone holder
- Head simulating tissue

The Following figure shows the system.

The EUT under test operating at the maximum power level is placed in the phone holder, under the phantom, which is filled with head simulating liquid. The E-Field probe measures the electric field inside the phantom. The OpenSAR software computes the results to give a SAR value in a 1g or 10g mass.

3.2 Probe

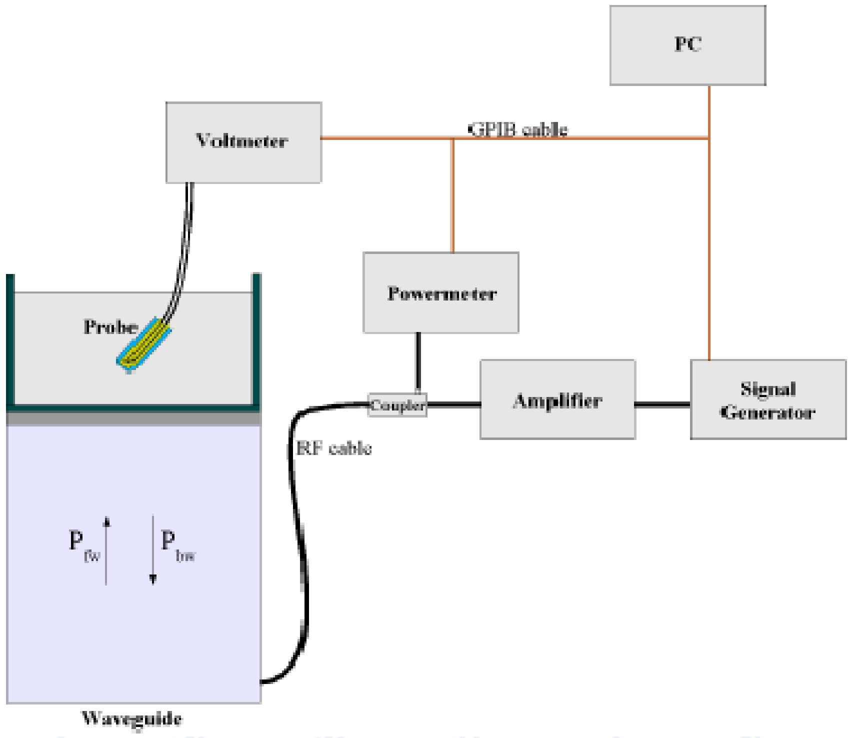
For the measurements the Specific Dosimetric E-Field Probe SN 37/08 EP80 with Following specifications is used

- Dynamic range: 0.01-100 W/kg
- Tip Diameter: 6.5 mm

- Distance between probe tip and sensor center: 2.5mm
- Distance between sensor center and the inner phantom surface: 4 mm (repeatability better than +/- 1mm)
- Probe linearity: <0.25 dB
- Axial Isotropy: <0.25 dB
- Spherical Isotropy: <0.25 dB
- Calibration range: 835to 2500MHz for head & body simulating liquid.

Angle between probe axis (evaluation axis) and surface normal line: less than 30°

Probe calibration is realized, in compliance with CENELEC EN 62209 and IEEE 1528 std, with CALISAR, Antennessa proprietary calibration system. The calibration is performed with the EN 622091 annex technique using reference guide at the five frequencies.



$$SAR = \frac{4\left(P_{fw} - P_{bw}\right)}{ab\delta} \cos^2\left(\pi \frac{y}{a}\right) e^{(2z/\delta)}$$

Where :

Pfw = Forward Power

Pbw = Backward Power

a and b = Waveguide dimensions

ı = Skin depth

Keithley configuration:

Rate = Medium; Filter =ON; RDGS=10; FILTER TYPE =MOVING AVERAGE; RANGE AUTO
After each calibration, a SAR measurement is performed on a validation dipole and compared with a NPL calibrated probe, to verify it.

The calibration factors, CF(N), for the 3 sensors corresponding to dipole 1, dipole 2 and dipole 3 are:

CF(N)=SAR(N)/Vlin(N) (N=1,2,3)

The linearised output voltage Vlin(N) is obtained from the displayed output voltage V(N) using

Vlin(N)=V(N)*(1+V(N)/DCP(N)) (N=1,2,3)

Where DCP is the diode compression point in mV.

3.3 Probe Calibration Process

3.3.1 Dosimetric Assessment Procedure

Each E-Probe/Probe Amplifier combination has unique calibration parameters. SATIMO Probe 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 with CALISAR, Antenna proprietary calibration system.

3.3.2 Free Space Assessment Procedure

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 in 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 rotated 360 degrees until the three channels show the maximum reading. The power density readings equates to 1 mW/cm^2.

3.3.3 Temperature Assessment Procedure

E-field temperature correlation calibration is performed in a flat phantom filled with the appropriate simulating head 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.

Where:

δt = exposure time (30 seconds),

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

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

δT = temperature increase due to RF exposure.

SAR is proportional to ΔT/Δt, the initial rate of tissue heating, before thermal diffusion takes place. The electric field in the simulated tissue can be used to estimate SAR by equating the thermally derived SAR to that with the E- field component.

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

Where:

σ = simulated tissue conductivity,

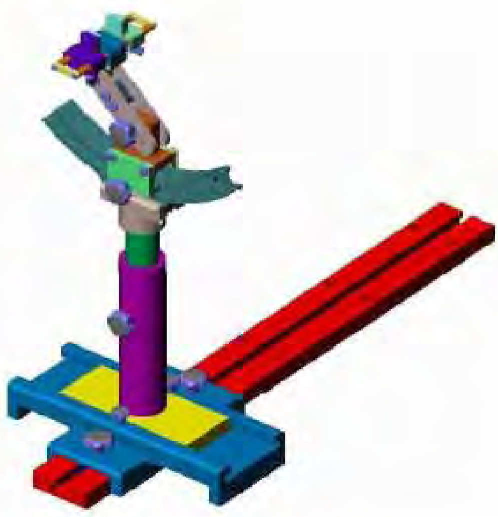
ρ = Tissue density (1.25 g/cm³ for brain tissue)

3.4 Phantom

For the measurements the Specific Anthropomorphic Mannequin (SAM) defined by the IEEE SCC-34/SC2 group is used. The phantom is a polyurethane shell integrated in a wooden table. The thickness of the phantom amounts to 2mm +/- 0.2mm. It enables the dosimetric evaluation of left and right phone usage and includes an additional flat phantom part for the simplified performance check. The phantom set-up includes a cover, which prevents the evaporation of the liquid.

3.5 Device Holder

The positioning system allows obtaining cheek and tilting position with a very good accuracy. In compliance with CENELEC, the tilt angle uncertainty is Middle than 1°.



Device holder

System Material	Permittivity	Loss Tangent
Delrin	3.7	0.005

4. TISSUE SIMULATING LIQUIDS

For SAR measurement of the field distribution inside the phantom, the phantom must be filled with homogeneous tissue simulating liquid to a depth of at least 15 cm. For head SAR testing, the liquid height from the ear reference point (ERP) of the phantom to the liquid top surface is larger than 15 cm. For body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15 cm. The nominal dielectric values of the tissue simulating liquids in the phantom and the tolerance of 5% are listed in below table.

The following table gives the recipes for tissue simulating liquids

Frequency Band (MHz)	750	835		1750	1900		2450	2600
Tissue Type	Body	Head	Body	Body	Head	Body	Body	Body
Ingredients (% by weight)								
Deionised Water	50.00	50.36	50.20	68.80	54.90	40.40	73.20	68.1
Salt(NaCl)	0.80	1.25	0.90	0.20	0.18	0.50	0.10	0.10
Sugar	48.80	0.00	48.50	0.00	0.00	58.00	0.00	0.00
Tween 20	0.00	48.39	0.00	0.00	0.00	0.00	0.00	0.00
HEC	0.20	0.00	0.20	0.00	0.00	1.00	0.00	0.00
Bactericide	0.20	0.00	0.20	0.00	0.00	0.10	0.00	0.00
Triton X-100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DGBE	0.00	0.00	0.00	31.00	44.92	0.00	26.70	31.8
Diethylenglycol monohexylether	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Target dielectric parameters								
Dielectric Constant	55.50	41.50	56.10	53.40	39.90	53.30	52.70	52.5
Conductivity (S/m)	0.96	0.90	0.95	1.49	1.42	1.52	1.95	2.16

Note: Please refer to the validation results for dielectric parameters of each frequency band.

The dielectric properties of the tissue simulating liquids were verified prior to the SAR evaluation using an Agilent 85033E Dielectric Probe Kit and an Agilent Network Analyzer.

Table 1: Dielectric Performance of Tissue Simulating Liquid

Temperature: 22.0~23.8°C, humidity: 54~60%.						
Date	**Freq.(MHz)**	**Liquid Parameters**	**Meas.**	**Target**	**Delta(%)**	**Limit±(%)**
2015/09/16	Body 835	Relative Permittivity(εr):	55.69	56.10	-0.73	5
		Conductivity(σ):	0.97	0.95	2.11	5
2015/09/17	Body 1900	Relative Permittivity(εr):	53.10	53.3	-0.38	5
		Conductivity(σ):	1.53	1.52	0.66	5
2015/09/17	Body 2600	Relative Permittivity(εr):	52.45	52.50	-0.10	5
		Conductivity(σ):	2.10	2.16	-2.78	5

5. UNCERTAINTY ASSESSMENT

The Following table includes the uncertainty table of the IEEE 1528. The values are determined by Antennessa.

5.1 UNCERTAINTY EVALUATION FOR EUT SAR TEST

a	b	c	d	e= f(d,k)	f	g	h= c*f/e	i= c*g/e	k
Uncertainty Component	Sec.	Tol (+- %)	Prob. Dist.	Div.	Ci (1g)	Ci (10g)	1g Ui (+-%)	10g Ui (+-%)	Vi
Measurement System									
Probe calibration	E.2.1	4.76	N	1	1	1	4.76	4.7	∞
Axial Isotropy	E.2.2	2.5	R	$\sqrt{3}$	0.7	0.7	1.01	1.0	∞
Hemispherical Isotropy	E.2.2	4.0	R	$\sqrt{3}$	0.7	0.7	1.62	1.6	∞
Boundary effect	E.2.3	1.0	R	$\sqrt{3}$	1	1	0.58	0.5	∞
Linearity	E.2.4	5.0	R	$\sqrt{3}$	1	1	2.89	2.8	∞
System detection limits	E.2.5	1.0	R	$\sqrt{3}$	1	1	0.58	0.5	∞
Readout Electronics	E.2.6	0.02	N	1	1	1	0.02	0.0	∞
Reponse Time	E.2.7	3.0	R	$\sqrt{3}$	1	1	1.73	1.7	∞
Integration Time	E.2.8	2.0	R	$\sqrt{3}$	1	1	1.15	1.1	∞
RF ambient Conditions	E.6.1	3.0	R	$\sqrt{3}$	1	1	1.73	1.7	∞
Probe positioner Mechanical Tolerance	E.6.2	2.0	R	$\sqrt{3}$	1	1	1.15	1.15	∞
Probe positioning with respect to Phantom Shell	E.6.3	0.05	R	$\sqrt{3}$	1	1	0.03	0.03	∞
Extrapolation, interpolation and integration Algoritms for Max. SAR Evaluation	E.5.2	5.0	R	$\sqrt{3}$	1	1	2.89	2.89	∞
Test sample Related									
Test sample positioning	E.4.2.1	0.03	N	1	1	1	0.03	0.03	N-1
Device Holder Uncertainty	E.4.1.	5.00	N	1	1	1	5.00	5.0	N-

	1							0	1
Output power Power drift - SAR drift measurement	6.6.2	4.04	R	$\sqrt{3}$	1	1	2.33	2.3 3	∞
Phantom and Tissue Parameters									
Phantom Uncertainty (Shape and thickness tolerances)	E.3.1	0.05	R	$\sqrt{3}$	1	1	0.03	0.0 3	∞
Liquid conductivity - deviation from target value	E.3.2	4.57	R	$\sqrt{3}$	0.64	0.43	1.69	1.1 3	∞
Liquid conductivity - measurement uncertainty	E.3.3	5.00	N	1	0.64	0.43	3.20	2.1 5	M
Liquid permittivity - deviation from target value	E.3.2	3.69	R	$\sqrt{3}$	0.6	0.49	1.28	1.0 4	∞
Liquid permittivity - measurement uncertainty	E.3.3	10.0 0	N	1	0.6	0.49	6.00	4.9 0	M
Combined Standard Uncertainty			RSS				11.55	10. 67	
Expanded Uncertainty (95% Confidence interval)			K=2				23.11	21. 33	

5.2 UNCERTAINTY FOR SYSTEM PERFORMANCE CHECK

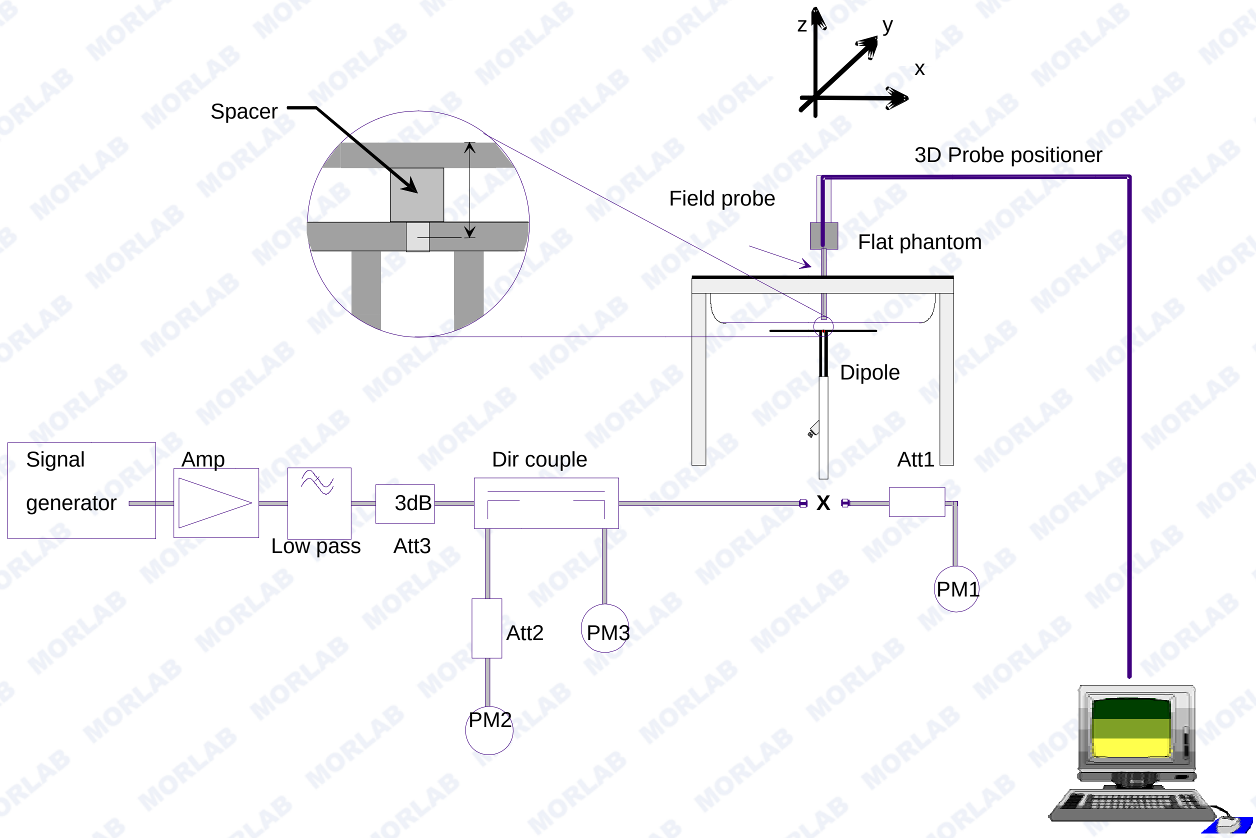
a	b	c	d	e= f(d,k)	f	g	h= c*f/e	i= c*g/ e	k
Uncertainty Component	Sec.	Tol (+- %)	Prob . Dist.	Div.	Ci (1g)	Ci (10g)	1g Ui (+-%)	10g Ui (+- %)	Vi
Measurement System									
Probe calibration	E.2.1	4.76	N	1	1	1	4.76	4.7	∞
Axial Isotropy	E.2.2	2.5	R	$\sqrt{3}$	0.7	0.7	1.01	1.0	∞
Hemispherical Isotropy	E.2.2	4.0	R	$\sqrt{3}$	0.7	0.7	1.62	1.6	∞
Boundary effect	E.2.3	1.0	R	$\sqrt{3}$	1	1	0.58	0.5	∞
Linearity	E.2.4	5.0	R	$\sqrt{3}$	1	1	2.89	2.8	∞
System detection limits	E.2.5	1.0	R	$\sqrt{3}$	1	1	0.58	0.5	∞
Readout Electronics	E.2.6	0.02	N	1	1	1	0.02	0.0	∞

Reponse Time	E.2.7	3.0	R	$\sqrt{3}$	1	1	1.73	1.7	∞
Integration Time	E.2.8	2.0	R	$\sqrt{3}$	1	1	1.15	1.1	∞
RF ambient Conditions	E.6.1	3.0	R	$\sqrt{3}$	1	1	1.73	1.7	∞
Probe positioner Mechanical Tolerance	E.6.2	2.0	R	$\sqrt{3}$	1	1	1.15	1.15	∞
Probe positioning with respect to Phantom Shell	E.6.3	0.05	R	$\sqrt{3}$	1	1	0.03	0.03	∞
Extrapolation, interpolation and integration Algoritms for Max. SAR Evaluation	E.5.2	5.0	R	$\sqrt{3}$	1	1	2.89	2.89	∞
Dipole									
Dipole axis to liquid Distance	8,E.4.2	1.00	N	$\sqrt{3}$	1	1	0.58	0.58	∞
Input power and SAR drift measurement	8,6.6.2	4.04	R	$\sqrt{3}$	1	1	2.33	2.33	∞
Phantom and Tissue Parameters									
Phantom Uncertainty (Shape and thickness tolerances)	E.3.1	0.05	R	$\sqrt{3}$	1	1	0.03	0.03	∞
Liquid conductivity - deviation from target value	E.3.2	4.57	R	$\sqrt{3}$	0.64	0.43	1.69	1.13	∞
Liquid conductivity - measurement uncertainty	E.3.3	5.00	N	$\sqrt{3}$	0.64	0.43	1.85	1.24	M
Liquid permittivity - deviation from target value	E.3.2	3.69	R	$\sqrt{3}$	0.6	0.49	1.28	1.04	∞
Liquid permittivity - measurement uncertainty	E.3.3	10.00	N	$\sqrt{3}$	0.6	0.49	3.46	2.83	M
Combined Standard Uncertainty			RSS				8.83	8.37	
Expanded Uncertainty (95% Confidence interval)			K=2				17.66	16.73	

6. SAR MEASUREMENT EVALUATION

6.1 System Setup

In the simplified setup for system evaluation, the DUT is replaced by a calibrated dipole and the power source is replaced by a continuous wave which 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 system check verifies that the system operates within its specifications. It is performed daily or before every SAR measurement. The system check uses normal SAR measurements in the flat section of the phantom with a matched dipole at a specified distance. The system verification setup is shown as below



The validation dipole is placed beneath the flat phantom with the specific spacer in place. The distance spacer is touch the phantom surface with a light pressure at the reference marking and be oriented parallel to the long side of the phantom. The power meter PM1 measures the forward power at the location of the system check dipole connector. The signal generator is adjusted for the desired forward power (250 mW is used for 700 MHz to 3 GHz,100 mW is used for 3.5 GHz to

6 GHz) at the dipole connector and the power meter PM2 is read at that level. After connecting the cable to the dipole, the signal generator is readjusted for the same reading at power meter PM2.

6.2 Validation Results

After system check testing, the SAR result will be normalized to 1W forward input power and compared with the reference SAR value derived from validation dipole certificate report. The deviation of system check should be within 10 %.

Frequency	835MHz(B)	1900MHz(B)	2600MHz(B)
Target value 1W (1g)	10.04 W/Kg	42.36W/Kg	57.73 W/Kg
Test value 1g (100 mW input power)	0.992 W/Kg (08.26)	4.348 W/Kg (08.27)	5.487 W/Kg (08.28)
Normalized to 1W value(1g)	9.92 W/Kg	43.48 W/Kg	54.87 W/Kg

Note: System checks the specific test data please see Annex D

7. OPERATIONAL CONDITIONS DURING TEST

7.1 Body-worn Configurations

The body-worn configurations shall be tested with the supplied accessories (belt-clips, holsters, etc.) attached to the device in normal use configuration.

For body-worn and other configurations a flat phantom shall be used which is comprised of material with electrical properties similar to the corresponding tissues.

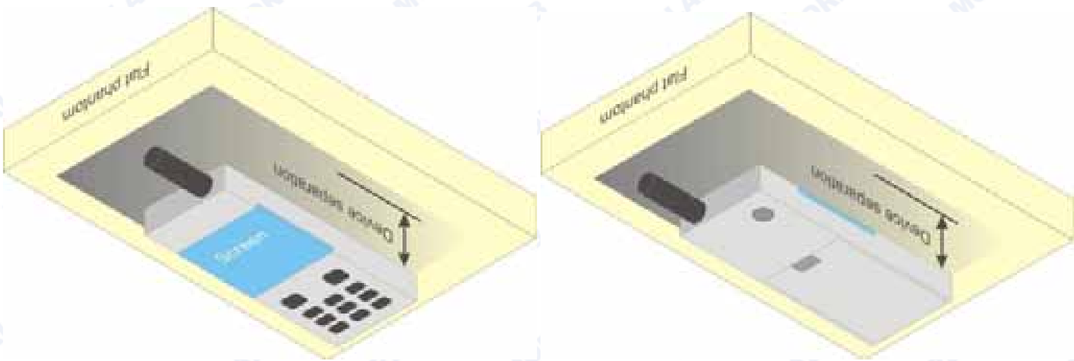


Illustration for Body Worn Position

7.2 Measurement procedure

The Following steps are used for each test position

1. Establish a call with the maximum output power with a base station simulator. The connection between the mobile and the base station simulator is established via air interface.
2. Measurement of the local E-field value at a fixed location. This value serves as a reference value for calculating a possible power drift.
3. Measurement of the SAR distribution with a grid of 8 to 16mm * 8 to16 mm and a constant distance to the inner surface of the phantom. Since the sensors cannot directly measure at the inner phantom surface, the values between the sensors and the inner phantom surface are extrapolated. With these values the area of the maximum SAR is calculated by an interpolation scheme.
4. Around this point, a cube of 30 * 30 * 30 mm or 32 * 32 * 32 mm is assessed by measuring 5 or 8 * 5 or 8*4 or 5 mm. With these data, the peak spatial-average SAR value can be calculated.

7.3 Description of interpolation/extrapolation scheme

The local SAR inside the phantom is measured using small dipole sensing elements inside a probe body. The probe tip must not be in contact with the phantom surface in order to minimize measurements errors, but the highest local SAR will occur at the surface of the phantom.

An extrapolation is using to determinate this highest local SAR values. The extrapolation is based on a fourth-order least-square polynomial fit of measured data. The local SAR value is then extrapolated from the liquid surface with a 1mm step.

The measurements have to be performed over a limited time (due to the duration of the battery) so the step of measurement is high. It could vary between 5 and 8 mm. To obtain an accurate assessment of the maximum SAR averaged over 10 grams and 1 gram requires a very fine resolution in the three dimensional scanned data array.

8. Information Related to LTE Test parameter(Per 941225 D05v02r03)

<table>
<tr><td>1</td><td>Identify the operating frequency range of each LTE transmission FCC band used by the device</td><td colspan="7">Band 2
Tx:1850-1910 MHz Rx:2110-2155 MHz
Band 7
Tx:2500-2570 MHz Rx:2620-2690 MHz</td></tr>
<tr><td rowspan="10">2</td><td rowspan="10">Identify the high, middle and low (L, M, H) channel numbers and frequencies tested in each LTE frequency band</td><td rowspan="2">Band2</td><td colspan="6">Channel Bandwidth</td></tr>
<tr><td>20Mhz</td><td>15MHz</td><td>10MHz</td><td>5MHz</td><td>3MHz</td><td>1.4MHz</td></tr>
<tr><td>Low</td><td>20050/
1720</td><td>20025/
1717.5</td><td>20000/
1715</td><td>19975/
1712.5</td><td>19965/
1711.5</td><td>19957/
1710.7</td></tr>
<tr><td>Middle</td><td>20175/
1732.5</td><td>20175/
1732.5</td><td>20175/
1732.5</td><td>20175/
1732.5</td><td>20175/
1732.5</td><td>20175/
1732.5</td></tr>
<tr><td>High</td><td>20300/
1745</td><td>20325/
1747.5</td><td>20350/
1750</td><td>20375/
1752.5</td><td>20384/
1753.5</td><td>20392/
1754.2</td></tr>
<tr><td rowspan="2">Band7</td><td colspan="6">Channel Bandwidth</td></tr>
<tr><td>20Mhz</td><td>15MHz</td><td>10MHz</td><td>5MHz</td><td>3MHz</td><td>1.4MHz</td></tr>
<tr><td>Low</td><td>20850/
2510</td><td>20825/
2507.2</td><td>20800/
2505</td><td>20775/
2502.5</td><td>/</td><td>/</td></tr>
<tr><td>Middle</td><td>21100/
2535</td><td>21100/
2535</td><td>21100/
2535</td><td>21100/
2535</td><td>/</td><td>/</td></tr>
<tr><td>High</td><td>21350/
2560</td><td>21375/
2562.5</td><td>21400/
2565</td><td>21425/
2567.5</td><td>/</td><td>/</td></tr>
<tr><td>3</td><td>Specify the UE category and uplink modulations used</td><td colspan="7">The UE Category is 4 and the uplink modulations used are QPSK and 16QAM.</td></tr>
<tr><td>4</td><td>Descriptions of the LTE transmitter and antenna implementation & identify whether it is a standalone transmitter operating independently of other wireless transmitters in the device or sharing hardware components and/or antenna(s) with other transmitters etc.</td><td colspan="7">The module has a primary antenna for all LTE&UMTS bands, a Wi-Fi Tx/Rx antenna.</td></tr>
<tr><td>5</td><td>Identify the LTE Band Voice/data requirements in each operating mode and</td><td colspan="7">Mobile Hotspot Mode will be tested according to Section 9 of this report.</td></tr>
</table>

<table>
<tr><td></td><td>exposure condition with respect to head and body test configurations, antenna locations, handset flip-cover or slide positions, antenna diversity conditions, etc.</td><td></td></tr>
<tr><td>6</td><td>Identify if Maximum Power Reduction (MPR) is optional or mandatory, i.e. built-in by design:
only mandatory MPR may be considered during SAR testing, when the maximum output power is permanently limited by the MPR implemented within the UE; and only for the applicable RB (resource block) configurations specified in LTE standards
b) A-MPR (additional MPR) must be disabled.</td><td>As per 3GPP TS 36.101 v11.0.0 (2012-03)
Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 3
<table>
<tr><th rowspan="2">Modulation</th><th colspan="6">Channel bandwidth / Transmission bandwidth (N_{RB})</th><th rowspan="2">MPR (dB)</th></tr>
<tr><th>1.4 MHz</th><th>3.0 MHz</th><th>5 MHz</th><th>10 MHz</th><th>15 MHz</th><th>20 MHz</th></tr>
<tr><td>QPSK</td><td>> 5</td><td>> 4</td><td>> 8</td><td>> 12</td><td>> 16</td><td>> 18</td><td>≤ 1</td></tr>
<tr><td>16 QAM</td><td>≤ 5</td><td>≤ 4</td><td>≤ 8</td><td>≤ 12</td><td>≤ 16</td><td>≤ 18</td><td>≤ 1</td></tr>
<tr><td>16 QAM</td><td>> 5</td><td>> 4</td><td>> 8</td><td>> 12</td><td>> 16</td><td>> 18</td><td>≤ 2</td></tr>
</table>

A-MPR is supported by design, but disable for SAR testing.</td></tr>
<tr><td>7</td><td>Include the maximum average conducted output power measured on the required test channels for each channel bandwidth and UL modulation used in each frequency band:
a) with 1 RB allocated at the low, centred, high end of a channel
b) using 50% RB allocation low, centered, high end within a channel
c) using 100% RB allocation</td><td>This is included in the section 11 of this report.</td></tr>
<tr><td>8</td><td>Include the maximum average conducted output</td><td>This is included in the section 13 of this report.</td></tr>
</table>

	power measured for the other wireless mode and frequency bands	
10	Identify the simultaneous transmission conditions for the voice and data configurations supported by all wireless modes, device configurations and frequency bands, for the head and body exposure conditions and device operating configurations (handset flip or cover positions, antenna diversity conditions etc.)	
11	When power reduction is applied to certain wireless modes to satisfy SAR compliance for simultaneous transmission conditions, other equipment certification or operating requirements, include the maximum average conducted output power measured in each power reduction mode applicable to the simultaneous voice/data transmission configurations for such wireless configurations and frequency bands; and also include details of the power reduction implementation and measurement setup	Not applicable.

10. SAR EVALUATION PROCEDURES&POWER MEASUREMENT FOR LTE

“1. QPSK with 1 RB allocation

Start with the largest channel bandwidth and measure SAR for QPSK with 1 RB allocation, using the RB offset and *required test channel* combination with the highest maximum output power for RB offsets at the upper edge, middle and lower edge of each *required test channel*. When the *reported* SAR is ≤ 0.8 W/kg, testing of the remaining RB offset configurations and *required test channels* is not required for 1 RB allocation; otherwise, SAR is required for the remaining r*equired test channels* and only for the RB offset configuration with the highest output power for that channel.6 When the *reported* SAR of a *required test channel* is > 1.45 W/kg, SAR is required for all three RB offset configurations for that *required test channel*.

2. QPSK with 50% RB allocation

The procedures required for 1 RB allocation in 1. are applied to measure the SAR for QPSK with 50% RB allocation.

3. QPSK with 100% RB allocation

For QPSK with 100% RB allocation, SAR is not required when the highest maximum output
power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB
allocations and the highest *reported* SAR for 1 RB and 50% RB allocation in 1. and 2. are ≤ 0.8
W/kg. Otherwise, SAR is measured for the highest output power channel and if the *reported* SAR
is > 1.45 W/kg, the remaining *required test channels* must also be tested.

<u>Higher order modulations</u>

For each modulation besides QPSK; e.g., 16-QAM, 64-QAM, apply the QPSK procedures in sections 1. and 2.and 3. to determine the QAM configurations that may need SAR measurement. For each configuration identified as required for testing, SAR is required only when the highest maximum output power for the configuration in the higher order modulation is > ½ dB higher than the same configuration in QPSK or when the *reported* SAR for the QPSK configuration is > 1.45 W/kg.

4. Other channel bandwidth standalone SAR test requirements

For the other channel bandwidths used by the device in a frequency band, apply all the procedures required for the largest channel bandwidth in section 5.2 to determine the channels and RB configurations that need SAR testing and only measure SAR when the highest maximum output power of a configuration requiring testing in the smaller channel bandwidth is > ½ dB higher than the equivalent channel configurations in the largest channel bandwidth configuration or the *reported* SAR of a configuration for the largest channel bandwidth is > 1.45 W/kg.

The equivalent channel configuration for the RB allocation, RB offset and modulation etc. Is determined for the smaller channel bandwidth according to the same number of RB allocated in The largest channel bandwidth. For example, 50 RB in 10 MHz channel bandwidth does not apply to 5MHz channel bandwidth; therefore, this cannot be tested in the smaller channel bandwidth. However, 50% RB allocation in 10 MHz channel bandwidth is equivalent to 100% RB allocation in 5 MHz channel bandwidth; therefore, these are the equivalent configurations to be compared to determine the specific channel and configuration in the smaller channel bandwidth that need SAR testing.”

LTE BAND 2

Band Width	Channel	Freq.(MHZ)	Modulation	RB Configuration		Average Power (dBm)
				RB Size	RB Offset	
20MHz	L 18700	1860	QPSK	1	0	21.53
				1	49	22.03
				1	99	20.79
				50	0	20.48
				50	25	20.15
				50	49	20.03
				100	0	20.68
			16-QAM	1	0	20.48
				1	49	20.28
				1	99	20.5
				50	0	20.06
				50	25	20.11
				50	49	20.09
				100	0	19.55
	M 18900	1880	QPSK	1	0	21.55
				1	49	21.57
				1	99	21.34
				50	0	20.46
				50	25	20.41
				50	49	20.43
				100	0	20.73
			16-QAM	1	0	20.96
				1	49	20.53
				1	99	20.63
				50	0	20.07
				50	25	20.15
				50	49	20.19
				100	0	19.37
	H 19100	1900	QPSK	1	0	21.12
				1	49	21.48
				1	99	21.68
				50	0	20.41
				50	25	20.69
				50	49	20.76
				100	0	20.88
			16-QAM	1	0	20.15
				1	49	20.42
				1	99	20.25
				50	0	20.04
				50	25	19.98
				50	49	20.08
				100	0	19.29

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LTE BAND 2 (Continue)

Band Width	Channel	Freq.(MHZ)	Modulation	RB Configuration		Average Power (dBm)
				RB Size	RB Offset	
15MHz	L 18675	1857.5	QPSK	1	0	21.45
				1	37	21.39
				1	74	21.47
				36	0	20.48
				36	18	20.67
				36	35	20.48
				75	0	20.71
			16-QAM	1	0	20.51
				1	37	20.43
				1	74	20.61
				36	0	20.09
				36	18	20.15
				36	35	20.14
				75	0	19.59
	M 18900	1880	QPSK	1	0	21.36
				1	37	21.42
				1	74	21.66
				36	0	20.22
				36	18	20.49
				36	35	20.53
				75	0	20.5
			16-QAM	1	0	20.55
				1	37	20.79
				1	74	20.86
				36	0	20.08
				36	18	20.18
				36	35	20.14
				75	0	19.38
	H 19125	1902.5	QPSK	1	0	21.09
				1	37	21.47
				1	74	21.39
				36	0	20.48
				36	18	20.71
				36	35	20.64
				75	0	20.51
			16-QAM	1	0	20.78
				1	37	20.59
				1	74	20.67
				36	0	20.19
				36	18	20.16
				36	35	20.17
				75	0	19.67

LTE BAND 2 (Continue)

Band Width	Channel	Freq.(MHZ)	Modulation	RB Configuration		Average Power (dBm)
				RB Size	RB Offset	
10MHz	L 18650	1855	QPSK	1	0	21.68
				1	24	21.59
				1	49	21.64
				25	0	20.67
				25	12	20.80
				25	24	20.58
				50	0	20.45
			16-QAM	1	0	20.53
				1	24	20.61
				1	49	20.63
				25	0	20.18
				25	12	20.16
				25	24	20.09
				50	0	19.69
	M 18900	1880	QPSK	1	0	21.43
				1	24	21.45
				1	49	21.22
				25	0	20.41
				25	12	20.55
				25	24	20.44
				50	0	20.54
			16-QAM	1	0	20.88
				1	24	20.57
				1	49	20.74
				25	0	20.21
				25	12	20.19
				25	24	20.16
				50	0	19.4
	H 19150	1905	QPSK	1	0	21.58
				1	24	21.64
				1	49	21.71
				25	0	20.79
				25	12	20.71
				25	24	20.64
				50	0	20.54
			16-QAM	1	0	20.64
				1	24	20.68
				1	49	20.71
				25	0	20.17
				25	12	20.16
				25	24	20.20
				50	0	19.67

LTE BAND 2 (Continue)

Band Width	Channel	Freq.(MHZ)	Modulation	RB Configuration		Average Power (dBm)
				RB Size	RB Offset	
5MHz	L 18625	1852.5	QPSK	1	0	21.72
				1	12	21.71
				1	24	21.5
				12	0	20.69
				12	6	20.73
				12	11	20.68
				25	0	20.48
			16-QAM	1	0	20.96
				1	12	21.16
				1	24	20.89
				12	0	20.30
				12	6	20.28
				12	11	20.26
				25	0	19.38
	M 18900	1880	QPSK	1	0	21.41
				1	12	21.59
				1	24	21.45
				12	0	20.57
				12	6	20.51
				12	11	20.56
				25	0	20.53
			16-QAM	1	0	20.09
				1	12	20.03
				1	24	20.25
				12	0	19.87
				12	6	19.69
				12	11	19.89
				25	0	19.43
	H 19175	1907.5	QPSK	1	0	21.42
				1	12	21.56
				1	24	21.38
				12	0	20.64
				12	6	20.51
				12	11	20.61
				25	0	20.50
			16-QAM	1	0	20.64
				1	12	20.51
				1	24	20.54
				12	0	20.10
				12	6	20.16
				12	11	20.08
				25	0	19.41

LTE BAND 2 (Continue)

Band Width	Channel	Freq.(MHZ)	Modulation	RB Configuration		Average Power (dBm)
				RB Size	RB Offset	
3MHz	L 18615	1851.5	QPSK	1	0	21.69
				1	7	21.59
				1	14	21.48
				8	0	20.57
				8	4	20.54
				8	7	20.60
				15	0	20.53
			16-QAM	1	0	20.61
				1	7	20.51
				1	14	20.50
				8	0	20.15
				8	4	20.14
				8	7	20.04
				15	0	19.42
	M 18900	1880	QPSK	1	0	21.68
				1	7	21.61
				1	14	21.57
				8	0	20.58
				8	4	20.53
				8	7	20.61
				15	0	20.55
			16-QAM	1	0	20.54
				1	7	20.68
				1	14	20.61
				8	0	20.18
				8	4	20.13
				8	7	20.15
				15	0	19.53
	H 19185	1908.5	QPSK	1	0	21.49
				1	7	21.64
				1	14	21.53
				8	0	20.51
				8	4	20.64
				8	7	20.59
				15	0	20.53
			16-QAM	1	0	20.49
				1	7	20.68
				1	14	20.71
				8	0	20.29
				8	4	20.18
				8	7	20.22
				15	0	19.61

LTE BAND 2 (Continue)

Band Width	Channel	Freq.(MHZ)	Modulation	RB Configuration		Average Power (dBm)
				RB Size	RB Offset	
1.4MHz	L 18607	1850.7	QPSK	1	0	21.32
				1	2	21.24
				1	5	21.28
				3	0	21.45
				3	1	21.36
				3	2	21.37
				6	0	20.32
			16-QAM	1	0	20.65
				1	2	20.62
				1	5	20.63
				3	0	20.15
				3	1	20.29
				3	2	20.25
				6	0	19.34
	M 18900	1880	QPSK	1	0	21.43
				1	2	21.42
				1	5	21.42
				3	0	21.5
				3	1	21.47
				3	2	21.49
				6	0	20.48
			16-QAM	1	0	20.5
				1	2	20.45
				1	5	20.43
				3	0	20.05
				3	2	20.04
				3	5	20.06
				6	0	19.3
	H 19193	1909.3	QPSK	1	0	21.53
				1	2	21.23
				1	5	21.53
				3	0	21.61
				3	1	21.59
				3	2	21.44
				6	0	20.66
			16-QAM	1	0	20.17
				1	2	19.91
				1	5	19.74
				3	0	19.31
				3	1	19.25
				3	2	19.26
				6	0	19.56

LTE BAND 7

Band Width	Channel	Freq.(MHZ)	Modulation	RB Configuration		Average Power (dBm)
				RB Size	RB Offset	
20MHz	L 20850	2510	QPSK	1	0	19.75
				1	49	19.21
				1	99	19.51
				50	0	18.11
				50	25	18.10
				50	49	17.94
				100	0	17.98
			16-QAM	1	0	18.44
				1	49	18.11
				1	99	18.01
				50	0	17.59
				50	25	17.56
				50	49	17.60
				100	0	16.68
	M 21100	2535	QPSK	1	0	20.08
				1	49	20.25
				1	99	20.74
				50	0	18.66
				50	25	19.25
				50	49	19.18
				100	0	18.85
			16-QAM	1	0	18.87
				1	49	19.14
				1	99	19.72
				50	0	19.20
				50	25	18.91
				50	49	18.93
				100	0	17.65
	H 21350	2560	QPSK	1	0	20.72
				1	49	20.78
				1	99	20.99
				50	0	19.39
				50	25	19.25
				50	49	19.02
				100	0	19.24
			16-QAM	1	0	19.51
				1	49	19.55
				1	99	19.90
				50	0	19.51
				50	25	19.43
				50	49	19.34
				100	0	17.81

LTE BAND 7 (Continue)

Band Width	Channel	Freq.(MHZ)	Modulation	RB Configuration		Average Power (dBm)
				RB Size	RB Offset	
15MHz	L 20825	2507.5	QPSK	1	0	19.61
				1	37	19.67
				1	74	19.69
				36	0	18.48
				36	18	18.67
				36	35	18.57
				75	0	17.96
			16-QAM	1	0	18.89
				1	37	18.80
				1	74	18.69
				36	0	18.34
				36	18	18.28
				36	35	18.21
				75	0	16.62
	M 21100	2535	QPSK	1	0	19.97
				1	37	20.21
				1	74	20.64
				36	0	18.82
				36	18	19.34
				36	35	19.42
				75	0	19.08
			16-QAM	1	0	18.95
				1	37	19.42
				1	74	19.52
				36	0	19.05
				36	18	19.07
				36	35	18.94
				75	0	18.87
	H 21375	2562.5	QPSK	1	0	20.70
				1	37	20.68
				1	74	20.83
				36	0	19.58
				36	18	19.64
				36	35	19.65
				75	0	19.22
			16-QAM	1	0	19.12
				1	37	19.35
				1	74	19.64
				36	0	19.08
				36	18	19.03
				36	35	18.94
				75	0	17.94

LTE BAND 7 (Continue)

Band Width	Channel	Freq.(MHZ)	Modulation	RB Configuration		Average Power (dBm)
				RB Size	RB Offset	
10MHz	L 20800	2505	QPSK	1	0	19.95
				1	24	19.40
				1	49	19.43
				25	0	18.47
				25	12	18.51
				25	24	18.50
				50	0	18.36
			16-QAM	1	0	18.48
				1	24	18.46
				1	49	18.53
				25	0	18.18
				25	12	18.16
				25	24	18.09
				50	0	17.00
	M 21100	2535	QPSK	1	0	20.28
				1	24	20.04
				1	49	20.53
				25	0	19.16
				25	12	19.25
				25	24	19.29
				50	0	19.23
			16-QAM	1	0	18.80
				1	24	18.69
				1	49	18.90
				25	0	18.25
				25	12	18.20
				25	24	18.21
				50	0	17.96
	H 21400	2565	QPSK	1	0	20.52
				1	24	20.59
				1	49	20.67
				25	0	19.58
				25	12	19.53
				25	24	19.61
				50	0	19.29
			16-QAM	1	0	19.65
				1	24	19.53
				1	49	19.54
				25	0	19.05
				25	12	19.08
				25	24	19.11
				50	0	17.97

LTE BAND 7 (Continue)

Band Width	Channel	Freq.(MHZ)	Modulation	RB Configuration		Average Power (dBm)
				RB Size	RB Offset	
5MHz	L 20775	2502.5	QPSK	1	0	19.90
				1	12	19.83
				1	24	19.89
				12	0	18.74
				12	6	18.91
				12	11	18.95
				25	0	18.44
			16-QAM	1	0	18.60
				1	12	18.64
				1	24	18.66
				12	0	18.21
				12	6	18.20
				12	11	18.09
				25	0	17.06
	M 21100	2535	QPSK	1	0	20.19
				1	12	19.99
				1	24	20.22
				12	0	19.10
				12	6	19.21
				12	11	19.18
				25	0	19.14
			16-QAM	1	0	18.78
				1	12	18.69
				1	24	18.91
				12	0	18.34
				12	6	18.23
				12	11	18.20
				25	0	17.91
	H 21425	2567.5	QPSK	1	0	20.73
				1	12	20.82
				1	24	21.04
				12	0	19.93
				12	6	19.99
				12	11	19.81
				25	0	19.28
			16-QAM	1	0	19.32
				1	12	19.46
				1	24	19.54
				12	0	19.08
				12	6	19.04
				12	11	19.11
				25	0	17.73

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11. MEASUREMENT OF CONDUCTED OUTPUT POWER

1. WCDMA mode conducted output power values

Item	band	WCDMA 850			WCDMA 1900		
	ARFCN	4132	4183	4233	9262	9400	9538
	subtest	dBm			dBm		
5.2(WCDMA)	non	23.96	23.84	23.78	22.72	23.09	22.76
HSDPA	1	24.05	24.35	23.95	22.94	23.41	22.92
	2	24.07	24.32	24.00	23.01	23.38	22.95
	3	23.54	23.86	23.44	22.43	22.92	22.41
	4	23.56	23.83	23.51	22.52	22.87	22.46
HSUPA	1	24.05	23.92	23.94	22.91	23.30	22.63
	2	22.04	21.93	21.95	20.90	21.31	20.64
	3	23.06	22.91	22.93	21.92	22.32	21.62
	4	22.03	21.90	21.92	20.89	21.32	20.65
	5	24.04	23.93	23.91	22.90	23.29	22.62
HSPA+	1	23.97	23.97	24.11	22.93	23.24	22.73
Note	The Conducted RF Output Power test of WCDMA /HSDPA /HSUPA/HSPA+ was tested by power meter.						

2. GPRS Mode Conducted peak output power

Band	Channel	Frequency (MHz)	Output Power(dBm)			
			Slot 1	Slot 2	Slot 3	Slot 4
GSM 850	128	824.2	31.32	30.20	29.16	28.15
	190	836.6	31.75	30.63	29.59	28.48
	251	848.8	31.65	30.53	29.49	28.43
PCS 1900	512	1850.2	27.96	26.84	25.80	24.79
	661	1880.0	27.98	26.86	25.82	24.81
	810	1909.8	28.22	27.10	26.06	24.99

GPRS Time-based Average Power

Band	Channel	Frequency (MHz)	Output Power(dBm)			
			Slot 1	Slot 2	Slot 3	Slot 4
GSM 850	128	824.2	22.29	24.18	24.90	25.14
	190	836.6	22.72	24.61	25.33	25.57
	251	848.8	22.62	24.51	25.23	25.47
PCS 1900	512	1850.2	18.93	20.82	21.54	21.78
	661	1880.0	18.95	20.84	21.56	21.80
	810	1909.8	19.19	21.08	21.80	22.04

Timeslot consignations:

No. Of Slots	Slot 1	Slot 2	Slot 3	Slot 4
Slot Consignation	1Up4Down	2Up3Down	3Up2Down	4Up1Down
Duty Cycle	1:8	1:4	1:2.67	1:2
Correct Factor	-9.03dB	-6.02dB	-4.26dB	-3.01dB

3. EDGE Mode Conducted peak output power

Band	Channel	Frequency (MHz)	Output Power(dBm)			
			Slot 1	Slot 2	Slot 3	Slot 4
GSM 850	128	824.2	27.92	26.90	25.85	24.84
	190	836.6	27.65	26.63	25.58	24.57
	251	848.8	27.88	26.86	25.81	24.80
PCS 1900	512	1850.2	25.55	24.53	23.48	22.47
	661	1880.0	25.63	24.61	23.56	22.55
	810	1909.8	25.77	24.75	23.70	22.69

EDGE Time-based Average Power

Band	Channel	Frequency (MHz)	Output Power(dBm)			
			Slot 1	Slot 2	Slot 3	Slot 4
GSM 850	128	824.2	18.89	20.88	21.59	21.83
	190	836.6	18.62	20.61	21.32	21.56
	251	848.8	18.85	20.84	21.55	21.79
PCS 1900	512	1850.2	16.52	18.51	19.22	19.46
	661	1880.0	16.60	18.59	19.30	19.54
	810	1909.8	16.74	18.73	19.44	19.68

12. TEST RESULTS LIST

Summary of Measurement Results (GSM 850MHz Band)

Temperature: 21.0~23.8°C, humidity: 54~60%.							
Phantom Configurations		Device Test Positions	Device Test channel	SAR(W/Kg), 1g Peak	Scaling Factor	Scaled SAR (W/Kg), 1g	Plot No.
Body (5mm Separation)	GPRS	Horizontal-Up	190	0.771	1.005	0.775	1
		Horizontal-Down		0.729		0.733	
		Vertical-Front		0.554		0.557	
		Vertical-Back		0.566		0.569	

Summary of Measurement Results (GSM 1900MHz Band)

Temperature: 21.0~23.8°C, humidity: 54~60%.							
Phantom Configurations		Device Test Positions	Device Test channel	SAR(W/Kg), 1g Peak	Scaling Factor	Scaled SAR (W/Kg), 1g	Plot No.
Body (5mm Separation)	GPRS	Horizontal-Up	810	0.444	1.002	0.445	
		Horizontal-Down		0.769		0.771	2
		Vertical-Front		0.141		0.141	
		Vertical-Back		0.172		0.172	

Note:

1. GPRS/EDGE test Scenario (Based on the Max. Time-based Average Power)

Band	Channel	Slots	Power level	Duty Cycle
GPRS850	190	4	5	1:2
GPRS1900	810	4	0	1:2

2. SAR is not required for EDGE mode because its output power is less than that of GPRS mode.

Summary of Measurement Results (WCDMA 850MHz Band)

Temperature: 21.0~23.8°C, humidity: 54~60%.						
Phantom Configurations	Device Test Positions	Device Test channel	SAR(W/Kg), 1g Peak	Scaling Factor	Scaled SAR (W/Kg), 1g	Plot No.
Body (5mm Separation)	Horizontal-Up	4132	0.515	1.009	0.520	
	Horizontal-Down		0.556		0.561	3
	Vertical-Front		0.243		0.245	
	Vertical-Back		0.214		0.216	

Summary of Measurement Results (WCDMA 1900MHz Band)

Temperature: 21.0~23.8°C, humidity: 54~60%.						
Phantom Configurations	Device Test Positions	Device Test channel	SAR(W/Kg), 1g Peak	Scaling Factor	Scaled SAR (W/Kg), 1g	Plot No.
Body (5mm Separation)	Horizontal-Up	9262	0.890	1.197	1.065	
		9400	1.043	1.099	1.146	4
		9538	0.898	1.189	1.068	
	Horizontal-Down	9400	0.605	1.099	0.665	
	Vertical-Front		0.517		0.568	
	Vertical-Back		0.190		0.209	

Note:

1. When the 1-g SAR for the mid-band channel or the channel with the highest output power satisfy the following conditions, testing of the other channels in the band is not required. (Per KDB 447498 D01 General RF Exposure Guidance v05r02)
   ≤ 0.8 W/kg and transmission band ≤ 100 MHz
   ≤ 0.6 W/kg and, 100 MHz < transmission bandwidth ≤ 200 MHz
   ≤ 0.4 W/kg and transmission band > 200 MHz

2. The WCDMA mode is test with 12.2kbps RMC and TPC set to all "1", if maximum SAR for 12.2kbps RMC is ≤ 75% of the SAR limit (i.e. 1.2W/Kg 1g) and maximum average output of each RF channel with HSDPA/HSUPA active is less than 1/4 dB Middle than that measured without HSDPA/HSUPA using 12.2kbps RMC, according to KDB 941225D01v02, SAR is not required for this handset with HSPA capabilities.

4. BT & WiFi SAR test is conducted according to section 12 stand-alone SAR evaluation of this report.

5. During 802.11 testing, engineering testing software installed on the EUT can provide continuous transmitting RF signal. The RF signal utilized in SAR measurement has almost 100% duty cycle, and its crest factor is 1.

6. IEEE Std 1528-2013 require the middle channel to be tested first. This generally applies to wireless devices that are designed to operate in technologies with tight tolerances for maximum output power variations across channels in the band. When the maximum output power variation across the required test channels is > ½ dB, instead of the middle channel, the highest output power channel must be used.

7. Per KDB 447498, when the SAR procedures require multiple channels to be tested and the 1-g SAR for the highest output channel is less than 0.8 W/kg and peak SAR is less than 1.6W/kg, where the transmission band corresponding to all channels is ≤ 100 MHz, testing for the other channels is not required.

8. The WCDMA mode is test with 12.2kbps RMC and TPC set to all “1”, if maximum SAR for 12.2kbps RMC is ≤ 75% of the SAR limit (i.e. 1.2W/Kg 1g) and maximum average output of each RF channel with HSDPA/HSUPA active is less than 1/4 dB higher than that measured without HSDPA/HSUPA using 12.2kbps RMC, according to KDB 941225D01v02, SAR is not required for this handset with HSPA capabilities. This module supports 3GPP release R7 HSPA+ using QPSK only without 16QAM in the uplink. So PBA is not required for HSPA+.

Summary of Measurement Results (LTE Band 2 bandwidth 20MHz with QPSK 1RB)

Temperature: 21.0~23.8°C, humidity: 54~60%.							
Phantom Configurations		Device Test Positions	Device Test channel	SAR(W/Kg), 1g Peak	Scaling Factor	Scaled SAR (W/Kg), 1g	Plot No.
Body (5mm Separation)		Horizontal-Up	18900	0.673	1.114	0.750	5
		Horizontal-Down		0.457		0.509	
		Vertical-Front		0.215		0.240	
		Vertical-Back		0.188		0.209	

Summary of Measurement Results (LTE Band 2 bandwidth 20MHz with QPSK 50RB)

Temperature: 21.0~23.8°C, humidity: 54~60%.							
Phantom Configurations		Device Test Positions	Device Test channel	SAR(W/Kg), 1g Peak	Scaling Factor	Scaled SAR (W/Kg), 1g	Plot No.
Body (5mm Separation)		Horizontal-Up	18900	0.520	1.059	0.551	
		Horizontal-Down		0.348		0.369	
		Vertical-Front		0.194		0.205	
		Vertical-Back		0.151		0.160	

Additional LTE test requirement for 16QAM

Not required.

Additional LTE test requirement for other bandwidth

Not required.

Additional LTE test requirement for 20MHz with QPSK 100RB

Not required.

Summary of Measurement Results (LTE Band 7 bandwidth 20MHz with QPSK 1RB)

Temperature: 21.0~23.8°C, humidity: 54~60%.							
Phantom Configurations		Device Test Positions	Device Test channel	SAR(W/Kg), 1g Peak	Scaling Factor	Scaled SAR (W/Kg), 1g	Plot No.
Body (5mm Separation)		Horizontal-Up	21100	0.614	1.002	0.615	
		Horizontal-Down		0.723		0.724	6
		Vertical-Front		0.166		0.166	
		Vertical-Back		0.108		0.108	

Summary of Measurement Results (LTE Band 7 bandwidth 20MHz with QPSK 50RB)

Temperature: 21.0~23.8°C, humidity: 54~60%.							
Phantom Configurations		Device Test Positions	Device Test channel	SAR(W/Kg), 1g Peak	Scaling Factor	Scaled SAR (W/Kg), 1g	Plot No.
Body (5mm Separation)		Horizontal-Up	21100	0.457	1.025	0.468	
		Horizontal-Down		0.641		0.657	
		Vertical-Front		0.148		0.152	
		Vertical-Back		0.101		0.104	

Additional LTE test requirement for 16QAM
Not required.
Additional LTE test requirement for other bandwidth
Not required.
Additional LTE test requirement for 20MHz with QPSK 100RB
Not required.

Note :

1. IEEE Std 1528-2013 require the middle channel to be tested first. This generally applies to wireless devices that are designed to operate in technologies with tight tolerances for maximum output power variations across channels in the band. When the maximum output power variation across the required test channels is > ½ dB, instead of the middle channel, the highest output power channel must be used.

2. Per KDB 447498, when the SAR procedures require multiple channels to be tested and the 1-g SAR for the highest output channel is less than 0.8 W/kg and peak SAR is less than 1.6W/kg, where the transmission band corresponding to all channels is ≤ 100 MHz, testing for the other channels is not required.

3. The WCDMA mode is test with 12.2kbps RMC and TPC set to all "1", if maximum SAR for 12.2kbps RMC is ≤ 75% of the SAR limit (i.e. 1.2W/Kg 1g) and maximum average output of each RF channel with HSDPA/HSUPA active is less than 1/4 dB higher than that measured without HSDPA/HSUPA using 12.2kbps RMC, according to KDB 941225D01v02, SAR is not required for this handset with HSPA capabilities. This module supports 3GPP release R7 HSPA+ using QPSK only without 16QAM in the uplink. So PBA is not required for HSPA+.

3. Scaling Factor calculation

Band	Tune-up power tolerance(dBm)	SAR test channel Power (dBm)	Scaling Factor
GPRS 850	PCL = 5, PWR =28+-0.5(4 slots)	28.48	1.005
GPRS1900	PCL = 0, PWR =24.5+-0.5(4 slots)	24.99	1.002
WCDMA 850	Max output power =23(+1/-2)	23.96	1.009
WCDMA 1900	Max output power =22.5(+1/-2)	22.72	1.197
		23.09	1.099
		22.76	1.186
LTE BAND2 (QPSK)	Max output power =22+-0.5(1RB)	22.03	1.114
	Max output power =20.5+-0.5(50RB)	20.76	1.059
LTE BAND7 (QPSK)	Max output power =20.5+-0.5(1RB)	20.99	1.002
	Max output power =19+-0.5(50RB)	19.39	1.025

13. REPEATED SAR MEASUREMENT

In accordance with published RF Exposure KDB procedure 865664 D01 SAR measurement 100 MHz to 6 GHz. These additional measurements are repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device should be returned to ambient conditions (normal room temperature) with the battery fully charged before it is re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

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

Band	Test Position	Test Channel	Meas.SAR(W/kg)		Largest to Smallest SAR Ratio
			Original	Repeated	
WCDMA 1900	Body	9400	1.043	1.078	1.034

14. ANNEX A GENERAL INFORMATION

15. ANNEX B PHOTOGRAPHS OF THE EUT

16. ANNEX C PLOTS OF HIGH SAR TEST RESULTS

17. ANNEX D SYSTEM PERFORMANCE CHECK DATA

17. ANNEX A GENERAL INFORMATION

1. Identification of the Responsible Testing Laboratory

Company Name:	Shenzhen Morlab Communications Technology Co., Ltd.
Department:	Morlab Laboratory
Address:	FL.3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China
Responsible Test Lab Manager:	Mr. Su Feng
Telephone:	+86 755 36698555
Facsimile:	+86 755 36698525

2. Identification of the Responsible Testing Location

Name:	Shenzhen Morlab Communications Technology Co., Ltd. Morlab Laboratory
Address:	FL.3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China

3. List of Test Equipments

No.	Instrument	Type	Cal. Date	Cal. Due
1	PC	Dell (Pentium IV 2.4GHz, SN:X10-23533)	(n.a)	(n.a)
2	Network Emulator	Aglient (8960, SN:10752)	2015-2-21	1year
3	Network Analyzer	Agilent(E5071B ,SN:MY42404762)	2014-9-26	1year
4	Voltmeter	Keithley (2000, SN:1000572)	2014-9-24	1year
5	Signal Generator	Rohde&Schwarz (SMP_02)	2014-9-24	1year
6	Power Amplifier	PRANA (Ap32 SV125AZ)	2014-9-24	1year
7	Power Meter	Agilent (E4416A, SN:MY45102093)	2015-5-07	1year
8	Power Sensor	Agilent (N8482A, SN:MY41091706)	2015-5-07	1year
9	Directional coupler	Giga-tronics(SN:1829112)	2014-9-24	1year
10	Probe	Satimo (SN:SN 37/08 EP80)	2014-9-22	1year
11	Dielectric Probe Kit	Agilent (85033E)	2014-9-24	1year
12	Phantom	Satimo (SN:SN_36_08_SAM62)	2014-9-24	1year
13	Liquid	Satimo(Last Calibration: 2015-09-16 to 2015-09-17)	N/A	N/A
14	Dipole 835MHz	Satimo (SN 20/08 DIPC 99)	2014-9-22	1year
15	Dipole 1900MHz	Satimo (SN 30/13 DIP1G900-261)	2014-9-22	1year
16	Dipole 2600MHz	Satimo (SN 30/13 DIP2G600-265)	2014-9-22	1year

***** END OF REPORT *****