

# **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** 

TECHNOLOGY Co., Ltd. SHENZHEN MORLAB COMMUN CATIONS

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		Change History
Issue	Date	Reason for change
1.0	2015-10-08	First edition
MOL	3 111	B SELLE MORE THE SELLE MORE



## **TEST REPORT DECLARATION**

Applicant	Observa Telecom			
Applicant Address	c/ Monte Esquinza, 28 1°Drcha Madrid P.C.28010 SPAIN			
Manufacturer	Observa Telecom			
Manufacturer Address	c/ Monte Esquinza, 28 1°Drcha Madrid P.C.28010 SPAIN			
Product Name	LTE Cat 4 USB	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	8
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Reviewed by :	Zhu Zhan	, and
	Zhu Zhan	
Approved by :	Lene Dean	
	Zéra 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		
	MORE B ME SLAB	Devices		
2	IEEE 1528-2013 IEEE Recommended Practice for Determi			
	S ME SLAB ORLA	Spatial-Average Specific Absorption Rate (SAR) in the Human		
	True Moke a Mg	Head from Wireless Communications Devices:		
	AB ORLAN MI	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 <u>Uncontrolled Environment</u>

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. ( $\rho$ ). The equation description is as below:

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

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,  $\delta T$  is the temperature rise and  $\delta t$  the exposure duration, or related to the electrical field in the tissue by

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

Where  $\sigma$  is the conductivity of the tissue,  $\rho$  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

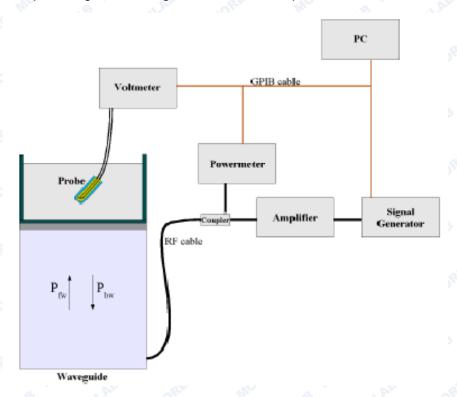
 Distance between sensor center and the inner phantom surface: 4 mm (repeatability better than +/- 1mm)

Probe linearity: <0.25 dB</li>
Axial Isotropy: <0.25 dB</li>
Spherical Isotropy: <0.25 dB</li>

- 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

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:

$$CF(N)=SAR(N)/VIin(N)$$

(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/cm²) 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<sup>2</sup>.

#### 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:

 $\delta t = \text{exposure time (30 seconds)},$ 





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

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

 $\delta T$  = temperature increase due to RF exposure.

SAR is proportional to  $\Delta T/\Delta t$ , 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.

Where:

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

 $\sigma$  = simulated tissue conductivity,

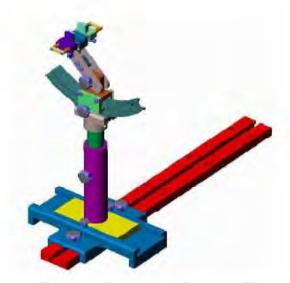
 $\rho$  = Tissue density (1.25 g/cm<sup>3</sup> for brain tissue)

#### 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	83	35	1750	19	000 110111	2450	2600
Tissue Type	Body	Head	Body	Body	Head	Body	Body	Body
Ingredients (% by we	ight )	LAB	OPLA	MOR	S W	LAB	ORLA	W <sub>O</sub>
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 para	meters	ORL	We	A.B	RLAR	MORL	Me	aB T
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	e: 22.0~23.8°0	C, humidity: 54~60%.	LAB	ORLA	MORE	BW
Date	Freq.(MHz	Liquid Parameters	Meas.	Target	Delta(%)	Limit±(%)
2045/00/40	Dody 025	Relative Permittivity(cr):	55.69	56.10	-0.73	5
2015/09/16	Body 835	Conductivity(σ):	0.97	0.95	2.11	5 5
2045/00/47	D - d - 4000	Relative Permittivity(cr):	53.10	53.3	-0.38	5
2015/09/17	Body 1900	Conductivity(σ):	1.53	1.52	0.66	5
0045/00/47	D - 1 - 0000	Relative Permittivity(cr):	52.45	52.50	-0.10	5
2015/09/17	Body 2600	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**

							3/3		
a not morting in the morting	b	C	d	e= f(d,k)	MORLAR	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	LAB	ORLA	1110	.0	4111	LAB	ORLA	N	0.
Probe calibration	E.2.1	4.76	N	1,082	1 410	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	0.58	0.5	∞
Linearity	E.2.4	5.0	R	$\sqrt{3}$	1 10	1	2.89	2.8	∞
System detection limits	E.2.5	1.0	R	$\sqrt{3}$	1	1 ORLAN	0.58	0.5	∞
Readout Electronics	E.2.6	0.02	N	1 100	1 💸	1	0.02	0.0	∞
Reponse Time	E.2.7	3.0	R	$\sqrt{3}$	1011111	1 , 1100	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	$\sqrt{3}$	10	1 ala	1.73	1.7	∞
Probe positioner  Mechanical Tolerance	E.6.2	2.0	R	$\sqrt{3}$	1	1	1.15	1.1 5	∞
Probe positioning with respect to Phantom Shell	E.6.3	0.05	R	$\sqrt{3}$	<b>11</b> 0	1 B	0.03	0.0	8
Extrapolation, interpolation and integration Algoritms for Max. SAR Evaluation	E.5.2	5.0	R	$\sqrt{3}$	AB W	1 HORLAE	2.89	2.8	8
Test sample Related	All	VOLET	41/6	, AB		RLAN	MORI	4/1	9
Test sample positioning	E.4.2.	0.03	N	1,020	1 W	1 NORLAS	0.03	0.0	N- 1
Device Holder Uncertainty	E.4.1.	5.00	N	1 110	1 💸	1	5.00	5.0	N-



	2	. 40		100	~~		70,		
2LAB CORL	1	VB In.	al.P	300	Line	More	" B W.	0	1
Output power Power drift -	6.6.2	4.04	R	$\sqrt{3}$	1 , 1	1	2.33	2.3	∞
SAR drift measurement	'B W	CLAP		RLA	Mole	B W	LAB	3	ORL
Phantom and Tissue Para	meters	MOL	.0	LAB	.(	RLA	MOL	0 1	
Phantom Uncertainty	E.3.1	0.05	R	$\sqrt{3}$	1, "	1 1 A	OP	0.0	∞
(Shape and thickness tolerances)	MOL OR	AB M	MORLA	s mor	LIV. A	More	0.03	3	.8
Liquid conductivity -	E.3.2	4.57	R	$\sqrt{3}$	0.64	0.43	1.69	1.1	∞
deviation from target value	AL	VO Br	2 11	AB	,	RLA!	MORI	3	
Liquid conductivity -	E.3.3	5.00	N	1,10R	0.64	0.43	3.20	2.1	М
measurement uncertainty	MORL	MIC	. 0	9	LAR	MORL	MO	5	3
Liquid permittivity -	E.3.2	3.69	R	$\sqrt{3}$	0.6	0.49	1.28	1.0	8
deviation from target value	NIO.	AB		QLAB	MORL	Mc	, AB	4	الماه
Liquid permittivity -	E.3.3	10.0	N 🐠	1 🙀	0.6	0.49	6.00	4.9	М
measurement uncertainty	oB.	0	LAB	MORL	4110			0	- 0
Combined Standard	MORL	Mo	RSS	9	LAB	JORL	11.55	10.	3
Uncertainty		AB	NORLE	MO	~	9	aLAE	67	
Expanded Uncertainty	Mo.	.0	K=2	alaB	*OBI	Mc	23.11	21.	210
(95% Confidence interval)	AB	ORLA	11/1	.6	Di.	LAB	ORLA	33	Ole

#### 5.2 UNCERTAINTY FOR SYSTEM PERFORMANCE CHECK

a West Late	b work	С	d	e=	f	g	h=		k
	A.B	RLAL	212	f(d,k)	Mic	OB.	c*f/e	c*g/	ORL
AB TARE OF	4	NO.	40	al Alb	٠.٥	2 les	Mo.	е	
<b>Uncertainty Component</b>	Sec.	Tol	Prob	Div.	Ci	Ci	1g Ui	10g	Vi
	More	(+-	· ALA	, o <sup>R</sup>	(1g)	(10g)	(+-%)	Ui	8
	ORI	%)	Dist.	B	LAP	.0	RLA	(+-	
3 ORLA MORE	BIN	LAB	.0	RLA	Moles	BIN	LAB	%)	RLA
Measurement System	Like	NOFE	9 111	LAB	.0	RLA	MORE	2 1/1	
Probe calibration	E.2.1	4.76	N	1,101	1, 1	1 100	4.76	4.7	8
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	1.8	0.58	0.5	∞
Linearity	E.2.4	5.0	R	$\sqrt{3}$	1 110	1 💦	2.89	2.8	∞
System detection limits	E.2.5	1.0	R	$\sqrt{3}$	1	108	0.58	0.5	∞
Readout Electronics	E.2.6	0.02	N	1,5	1 1 1 1	1	0.02	0.0	∞



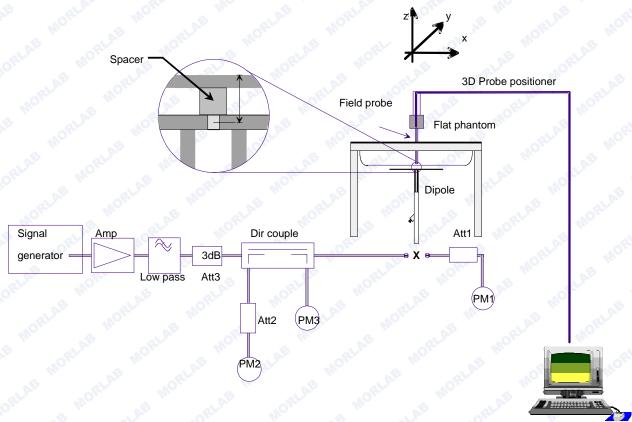
G. Company									
Reponse Time	E.2.7	3.0	R	$\sqrt{3}$	1	1,10	1.73	1.7	∞
Integration Time	E.2.8	2.0	R	$\sqrt{3}$	1	1	1.15	1.1	∞
RF ambient Conditions	E.6.1	3.0	R	$\sqrt{3}$	1	1,8	1.73	1.7	∞
Probe positioner  Mechanical Tolerance	E.6.2	2.0	R	$\sqrt{3}$	1 11	1	1.15	1.1 5	8
Probe positioning with respect to Phantom Shell	E.6.3	0.05	R	$\sqrt{3}$	1	1,1111	0.03	0.0	∞
Extrapolation, interpolation and integration Algoritms for Max. SAR Evaluation	E.5.2	5.0	R	$\sqrt{3}$	10.	1 MARINE	2.89	2.8	8
Dipole	OR	Like	Mole	S M	, AS	3	RLA	Mole	
Dipole axis to liquid Distance	8,E.4. 2	1.00	N	$\sqrt{3}$	,10h	1 M	0.58	0.5 8	∞
Input power and SAR drift measurement	8,6.6. 2	4.04	R	$\sqrt{3}$	1 M	1 NOPLAS	2.33	2.3	8
Phantom and Tissue Para	meters	Ale	MORE	Mo	0.5	3	QLAR	MORE	
Phantom Uncertainty (Shape and thickness tolerances)	E.3.1	0.05	R	$\sqrt{3}$	NIORE	1 M	0.03	0.0	8
Liquid conductivity - deviation from target value	E.3.2	4.57	R	$\sqrt{3}$	0.64	0.43	1.69	1.1	8
Liquid conductivity - measurement uncertainty	E.3.3	5.00	N	$\sqrt{3}$	0.64	0.43	1.85	1.2 4	M
Liquid permittivity - deviation from target value	E.3.2	3.69	R	$\sqrt{3}$	0.6	0.49	1.28	1.0 4	8
Liquid permittivity - measurement uncertainty	E.3.3	10.0 0	N	$\sqrt{3}$	0.6	0.49	3.46	2.8	M
Combined Standard Uncertainty	A.B	AORLA	RSS	RLAB	III.	RLAB	8.83	8.3 7	OF
Expanded Uncertainty (95% Confidence interval)	ORLAN	AE MOT	K=2	Ma MOE	LAB	MORLA	17.66	16. 73	3 11



### 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

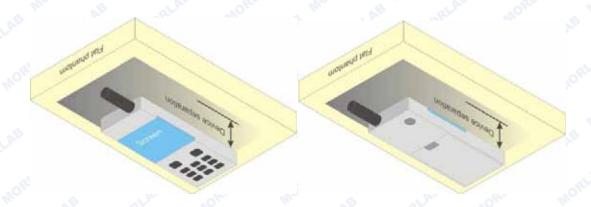


### 7. OPERATIONAL CONDITIONS DURING TEST

### 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

- 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 to 16 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)

al DE	Identify the operating	Band 2						
1	frequency range of each LTE	Tx:1850-	-1910 MHz	Rx:2110-	2155 MHz			
	transmission FCC band used	Band 7						
2 111	by the device	Tx:2500-	-2570 MHz	Rx:2620-	2690 MHz	ORL		
	MORE S ME	Band2	MORE	MILE	Channel	Bandwidt	h "Jo <sup>R</sup> "	14
100		Dalluz	20Mhz	15MHz	10MHz	5MHz	3MHz	1.4MHz
SPI		Low	20050/	20025/	20000/	19975/	19965/	19957/
2		LOW	1720	1717.5	1715	1712.5	1711.5	1710.7
2 1119		Middle	20175/	20175/	20175/	20175/	20175/	20175/
		Middle	1732.5	1732.5	1732.5	1732.5	1732.5	1732.5
68	Identify the high, middle and	Lliab	20300/	20325/	20350/	20375/	20384/	20392/
Plan	low (L, M, H) channel	High	1745	1747.5	1750	1752.5	1753.5	1754.2
	numbers and frequencies	AB	QLAB	MORL	Channel	Bandwidt	h alas	NORL
1110	tested in each LTE frequency	Band7	20Mhz	15MHz	10MHz	5MHz	3MHz	1.4MHz
P	band	-RLAS	20850/	20825/	20800/	20775/	MORI	4
60		Low	2510	2507.2	2505	2502.5		21.01
RL		OPT	21100/	21100/	21100/	21100/	1,5	, ,
		Middle	2535	2535	2535	2535		MORL
Mo		4	21350/	21375/	21400/	21425/	Mor	<b>3</b>
0		High	2560	2562.5	2565	2567.5	JORI	/ //
	Specify the UE category and	The UE	Category is	s 4 and the	e uplink mo	odulations	used are	QPSK and
3	uplink modulations used	16QAM.	MO					
	Descriptions of the LTE	25	QLAB	NORL	Wo.	A	2LAB	40RL
410	transmitter and antenna							
5	implementation & identify							
.0	whether it is a standalone							
RIL	transmitter operating	The mod	dule has a	nrimany ar	otoppa for	all TEXI	IMTS band	de a Wi-E
1	independently of other	Tx/Rx ar		primary ar	iterina ioi	all LILXU	INITO DATIC	15, a VVI-I
MO	wireless transmitters in the	1 WILL al	iteriria.					
>	device or sharing hardware							
	components and/or							
RLA	antenna(s) with other							
	transmitters etc.	- S INT	O.B	ORLA	MORE	NA NA	AB	RLA
1110	Identify the LTE Band	Mobile F	Hotspot Me	ode will h	e tested a	according	to Section	9 of thi
5	Voice/data requirements in	report.	.Stopot ivi	232 77111 0	2 100104 6		.5 00000	
	each operating mode and	(0)	Wes	OB.	QLA!	MORL	Mic	S. C.



ORLA	exposure condition with respect to head and body test configurations, antenna locations, handset flip-cover or slide positions, antenna	MORLAE M				E MOL			
ORLA	diversity conditions, etc.  Identify if Maximum Power Reduction (MPR) is optional or mandatory, i.e. built-in by design: only mandatory MPR may be	As per 3GPP Table 6.2.3-1			•	21	(MPR) 1	for Powe	r Class
	considered during SAR testing, when the maximum	MORLAL S M	Chan	nel width (	bandwi Ngg)	idth /	Trans	mission	MPR
6	output power is permanently limited by the MPR	Modulation	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	(dB)
111	implemented within the UE;	QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1
3	and only for the applicable	16 QAM	≤ 5	≤ 4	≤8	≤ 12	≤ 16	≤ 18	≤1 🦠
2	RB (resource block) configurations specified in	16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2
1119		A-IVIER IS SUL	ported	by des	ign, but	disable for	or SAR te	esting.	
3	b) A-MPR (additional MPR) must be disabled.	A-IVIFK IS SUP	ported	by des	ign, but	disable fo	or SAR te	esting.	MORLE
RLAS		A-WIFK IS SUP	ported	by des	ign, but	disable fo	or SAR te	esting.	HORL.
RLA	must be disabled.  Include the maximum average conducted output power measured on the required test channels for each channel bandwidth and	A-IVIPK IS SUP	ported	by des	ign, but	disable fo	or SAR te	esting.	HORL.
JRLAS	must be disabled.  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	This is include	B HORI	AE HOY	RIAE INCREA	DRIAE MORLAE	RLAE MO	esting.	HORLA HORLA
RLA ME	must be disabled.  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	MORLAGE MORLAGE MA	B HORI	AE HOY	RIAE INCREA	DRIAE MORLAE	RLAE MO	esting.	HOPLA HOPLA
RLAS	must be disabled.  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	MORLAGE MORLAGE MA	B HORI	AE HOY	RIAE INCREA	DRIAE MORLAE	RLAE MO	esting.	HOPLA NOPLA
SRLAS SRLAS	must be disabled.  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	MORLAGE MORLAGE MA	B HORI	AE HOY	RIAE INCREA	DRIAE MORLAE	RLAE MO	esting.	HORLA HORLA



ام		LA JORE HE SE STAR JORE HE
E LAS	power measured for the other wireless mode and frequency bands	MORLAE MORLAE MORLAE MORLAE MORLAE MORLAE MORLAE
0,0	Identify the simultaneous	HOR AE IN SLAE TORLE HOR AE IN
0	transmission conditions for	AE ORLE MOR SE THE SLAE ORLE MOR
To bu	the voice and data	SE THE SLAE OPLAN MORE SE THE SLAE
300	configurations supported by	ORLAN MORN SE ME SLAE ORLAN MORN SE
T.A.	all wireless modes, device	ME TIRE ORIAL MORE E ME TIRE ORIAL
10	configurations and frequency	HORE S HE LAB ORLAR HORE S HE
10	bands, for the head and body	AE ORLAN MORN E MC LAE ORLAN MOR
2 111	exposure conditions and	THE LAB ORLANDER MORE THE LAB
	device operating	ORIAN MORN SINCE LAB DRIAN MORN
, A <sup>2</sup>	configurations (handset flip or	ME AB SPLAN MORL MIC AB SPLAN
VOST	cover positions, antenna	MORE THE AR TRIAL MORE ME
	diversity conditions etc.)	AB TRIAL MORL THE AB TRIAL MOR
0	When power reduction is	A MIC ARE MICHEL MICHAEL AND ARE
	applied to certain wireless	CREAT MORE THE LAB CREAT MORE
, A <sup>g</sup>	modes to satisfy SAR	ME LEE TRIAL MORL THE LEE THE SKIAR
ORE	compliance for simultaneous	MORE THE ARE TREATE MORE THE
	transmission conditions, other	HE GRIAL MORL THE HE GRIAL MOR
2 111	equipment certification or	THE AB TRIAL MORE MICH
	operating requirements,	TRIAL MORL THE ARE TRIAL MORL
. 60	include the maximum	INC AE THE MORE MORE AE AE ARIAN
ORY	average conducted output	MORE MICE AND STEAM MORE MICE
11	power measured in each	Not applicable.
4110	power reduction mode	The applicable.
	applicable to the	THAT MORE MICH. AB IT THAT MORE
. 69	simultaneous voice/data	MC AB THE STEAM MORE MO AB TO STEAM
ORL	transmission configurations	MORE MORE MORE MORE
	for such wireless	AB " TLAB MORL MO, BE " TLAB MOR
1110	configurations and frequency	HO, DE W. ST'VE WOLF, HO, 'E W.
100	bands; and also include	TLAS HORL MOT US IN TLAS TORLIN
	details of the power reduction	NO. DE M. STYLE ROBITE MOLE OF ME STYLE
ORLE	implementation and	TORLY MOT SE IN SLAE CHILD
	measurement setup	M. PB TITE WOLL WE PB TO



# 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 *required 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.

#### Higher order modulations

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  $> \frac{1}{2}$  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  $> \frac{1}{2}$  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

		_		RB Con	Average Power	
Band Width	Channel	Freq.(MHZ)	Modulation	RB Size	RB Offset	(dBm)
Me	0	AL ARI	"ILO	1	0	21.53
B	LAL 10	MIC	.0	all 1	49	22.03
CLAN MO	S. Bu.	, AB	ORLA" MIC	1 0	99	20.79
20	2LAP	ORL	QPSK	50	0	20.48
RLL	MOL	M. A.B	QRL.	50	25	20.48
MO	ALAE	ORL	MO	50	49	20.03
RLA	Mole	lul.	E GRLA	100	0	20.68
MO	.0	1860	Mic.	100	alle o	20.48
AB	18700	MILE	AB	RLA 1	49	. 3/2
II.	.0	LAB	ORL. MC	1.0		20.28
O.B	RLA	"Ober 1	16-QAM		99	20.5
ORL	Mo.	LAB	10-QAIVI	50	0	20.06
ME OF	QLA.	MORE	IN OF	50	25	20.11
ORL	Mor	.6	E ORLIN	50	49	20.09
Mo	00	102	4100	100	0	19.55
AB	ST. MO	S In.	AB	1 1	0	21.55
MIC	20	2LAL	OKIL MI	1	49	21.57
AB	ORL. IV	"OL "	QPSK	1,00	99	21.34
ORL	MO	3LAB	QPSK	50	0	20.46
M. A.F	QRI.M.	MOLE	all all	50	25	20.41
ORL	M	-0 AV	I ORL	50	49	20.43
20MHz	AB	1880	PIL.	100	0	20.73
Alb O	18900	.6	LAP C	21 1 4	0	20.96
M	10900	RLA	Oler	1,6	49	20.53
LAB	ORL	Mo.	AB	1	99	20.63
MORE	ME	QLA!	16-QAM	50	0	20.07
I.AE	ORLAN	MO	a LAY	50	25	20.15
MORE	M	al al	"Obr	50	49	20.19
8 10.	NB S	Live MORE	la.	<b>100</b>	0 0	19.37
AL	MIC		alar ac	1 1	0	21.12
S W	AB	QRI.II	Dr. III	1.0	49	21.48
3 LAL	*ORT	MO SE	3LAE	1	99	21.68
NOF	W. VE	QRL.M.	QPSK	50	0	20.41
ALAE.	ORL	Mo	BULAR	50	25	20.69
MOL	Н	AB COL	MOK	50	<b>4</b> 9	20.76
.0	LAB OF	1900	A	100	RL 0 ME	20.88
A SA	HILL	1300	RILL MO	1 111	0	20.15
- C	19100	ORL	2.	1	49	20.42
RLA	MORE	W. OB	RLA	. 10 <sup>16</sup> 1	99	20.25
Mo.	AB	ORL	16-QAM	50	0	20.04
QLA!	MORE	W	B QLA	50	25	19.98
More	0 10	AB ORL	WOL.	50	49	20.08
.0	LAT	MIC	.0	100	0	19.29



Band Width	Channel	Freq.(MHZ)	Modulation	RB Configuration		Average Power
Danu Widin				RB Size	RB Offset	(dBm)
Mo	.0	Ar OR	W.	. 6 1	0	21.45
OB	AE SLAT MOS	Me	a.B	all 1	37	21.39
MC		LAB	ORLIN	1.0	74	21.47
O.B		MORE	QPSK	36	0	20.48
ORL		II. AB	ORL	36	18	20.67
W. O.E.	-RI.A.	MORE	INC. OF	36	35	20.48
ORL	HIO.	4057.5	E ORLE	75	0	20.71
P.M.		1857.5	la.	<b>5</b> 1	0	20.51
LAE C	18675	. 6	LAB	RI. 1 W	37	20.43
M		ZLA.	Okr. W	100	74	20.61
A.A.B		WO.	16-QAM	36	0	20.09
MORE		QLA.	MORE	36	18	20.15
LAF		MOL	e m	36	35	20.14
MORL		all al	MORI	75	<b>0</b>	19.59
.0	LAP	MICE	. 6	- ARE 1	0 11	21.36
AL		60	QLATC	4	37	21.42
6		ORLAN	Dr. S. In.	-1.00	74	21.66
MORLAL C MORL LAF		Mrs all	QPSK	36	0	20.22
	ORLAN	More	36	18	20.49	
QLA!	M	MC	B QLA	36	35	20.53
451	0	4000	MOL	75	0	20.5
15MHz		1880	RIAE MC	21. P. 1	0	20.55
IIO	18900			1 0	37	20.79
NB .		"Obr	NB.	21	74	20.86
ORLAN		W. AB	16-QAM	36	0	20.08
III CE		MORLE	MIC OF	36	18	20.18
ORLAN		0	BORLIN	36	35	20.14
Mo		"UST	MIC	75	0	19.38
AB O	The Mo.	0,	AB	2 <sup>1</sup> 1 (1)	0 🐟	21.09
MIC		QLA!	DEC MC	1.5	37	21.47
LAB		MO,	AB	OR T	74	21.39
NORL		QLA.	QPSK	36	0	20.48
LAB		MO	S AF	36	18	20.71
MORL	Н	all al	MORE	36	35	20.64
. 6	LAB	1000 5	S W	75	0	20.51
A.O		1902.5	al.A.	1	0	20.78
19125	19125	ORLAN	D	1	37	20.59
		M. O.B.	R.L.A.	1	74	20.67
		ORL	16-QAM	36	0	20.19
QLAL		Me	B QLAF	36	18	20.16
MOL		AB ORL	Mor	36	35	20.17
.0		Mo	. 40	75	0	19.67



Band Width	Channel	Freq.(MHZ)	Modulation	RB Configuration		Average Power
Band Width	Channel			RB Size	RB Offset	(dBm)
Mo	. 6	LAP OR	Mo.	.0.1	0	21.68
AB .	AE SLAID	MIC	Q.B	alik 1	24	21.59
II.		LAB	ORL MC	1.0	49	21.64
Q.B		MORE	QPSK	25	0	20.67
ORL		LAB	ORL	25	12	20.80
UL O'E	LRLA	MOFFEE	MIC	25	24	20.58
ORL		1855	RE ORL	50	0	20.45
M		1600	les.	<b>3</b> 1	0	20.53
LAB	18650	-0	ALAB AC	2 1	24	20.61
PIL.		QL.A.	Ok. W	100	49	20.63
LAB		MO. B	16-QAM	25	0	20.18
MORE		RLA	MORE	25	12	20.16
LAF		Mo.	e LAF	25	24	20.09
MORE	P. L.	all al	MORE	50	<b>ॐ</b> 0	19.69
.0	LAL	MO	. 4	1 1	0	21.43
AL MOSE MAD	D.B	-RLA	1 - 1	24	21.45	
.0		ORL	,	-1	49	21.22
MILLE	W. VE	QPSK	25	0	20.41	
	ORL	MO.	25	12	20.55	
	M	LE GLA	25	24	20.44	
10MHz		1880	" WO.	50	0	20.54
TUIVINZ		1880	O.B	21.14	0 411	20.88
W. W.	18900		ORL	1.0	24	20.57
O.B		"Obr	a.B	21	49	20.74
ORL		LAB	16-QAM	25	0	20.21
ME		MORE	ME	25	12	20.19
ORL		.6	DE ORLE	25	24	20.16
M	aB c	LAT	MILE	50	0	19.4
AB O	III.	.0	ALAE C	1 1	0	21.58
M		- RI AL	Dien Me	1.0	24	21.64
LAB		Mo.	LAB	1	49	21.71
MOKE		-QLA	QPSK	25	o all	20.79
LAB		Mo.	B TLAP	25	12	20.71
MOFE	Н	AB al	MORE	25	24	20.64
.0		1905	A. W.	50	Er o m	20.54
Ollo	M	1900	RLA	1 1	0.0	20.64
~	19150	ORL	D	10.00	24	20.68
MORLAL MORL	W. O.B.	RLA	.10 <sup>10</sup> 1	49	20.71	
		ORL	16-QAM	25	0	20.17
R.L.A.L		IN.	a cla	25	12	20.16
Mo.		AB ORL	MO.	25	24	20.20
S .		lu de la companya della companya della companya de la companya della companya del	<b>3</b>	50	0 1111	19.67



Band Width	Channel	Freq.(MHZ)	Modulation	RB Configuration		Average Power
				RB Size	RB Offset	(dBm)
ME	. 60	LAR	W.	Ø 1	0	21.72
AB.	al.All	MIC	NB C	alik 1 an	12	21.71
Tr. MC		AB	ORLIN	1.0	24	21.5
oB.	QLA!	MORL	QPSK	12	0	20.69
ORLA	More	W. AB	ORLA	12	6	20.73
Mar OE	QLA!	MORLE	We of	12	11	20.68
ORL	WO.	4050.5	E ORL	25	0	20.48
Mo	NB .	1852.5	la.	<b>№</b> 1	al 0	20.96
LAB	18625	6	AB	R 1 W	12	21.16
III.C	3	al.Al.	O'EL MI	100	24	20.89
AB	ORLAN	WOL S	16-QAM	12	0	20.30
MORL	ME	QL.All	ORL	12	6	20.28
T.A.F	ORLAN	MOL	S W.	12	11	20.26
MORI	Me	OB OL	"OKI"	25	<b>ॐ</b> 0	19.38
Dr.	LAR	NO.	0.	1	O OF	21.41
LAL	The Work Was	<b>S</b>	al All	1 1	12	21.59
G M.	AB	ORLAN	Or S M.	1.0	24	21.45
QLAI.	ALAE NORL	MC OB	QPSK	12	0	20.57
MOL	In.	ORLAND	More	12	6	20.51
2LA!	М	ME	B SLA	12	11	20.56
- WO	IVI	AB too ORL	MOL	25	0	20.53
5MHz	ALAL MO	1880		21.12 1 -10	0 411	20.09
MO	18900	AB	SELL INC	1 0	12	20.03
3	2LAL	"OLT	18	21	24	20.25
ORLAN	More	W. AB	16-QAM	12	0	19.87
MC VE	al Al	ORL	MIC	12	6	19.69
RLine	Morra	S. W.	B ORLL	12	11	19.89
Mo	.0	LAB	MO	25	O O	19.43
AB	in allo	- W	AB	22 1 11	0	21.42
MIC	.0	3LAB	ORL MC	1.3	12	21.56
AB	RLIN	"OF	AB	1	24	21.38
ORL	MO	3LAD	QPSK	12	0	20.64
W. VE	RLA	MOL	a Mr.	12	6	20.51
NORL	H	3 N	ORL	12	√ 11	20.61
S U.	AB N	1007 4010	N.	25	RIL O	20.50
A	in We	1907.5	al h	1	0	20.64
S W	19175	ORLAN M	Dr. William	.1.1	12	20.51
al At	ORI	MC LE	2LAB	.40F	24	20.54
HOLE	IN OR	ARL AL	16-QAM	12	0	20.10
LAB	ORL	Mo	a LAP	12	6	20.16
Mole	W.	AB GRL	"IOFE"	12	11 0	20.18
. 65	LAB	IIIO.	. 6	25	0 1112	20.08 19.41



Band Width	Channel	Freq.(MHZ)	Modulation	RB Configuration		Average Power
	Channel			RB Size	RB Offset	(dBm)
Me	. 6	LAR	W.C.	. 9 1	0	21.69
O.B		MIC	o.B	al. 1	7	21.59
Tr. MC		LAB	ORL	1.0	14	21.48
0.B		MORE	QPSK	8	0	20.57
ORL		LAB	ORLA	8	4	20.54
M. O.E	QLA!	MORL	We e	8 📣	7.0	20.60
ORL	Mo.	4054.5	E ORL	15	0	20.53
M		1851.5	lu.	<b>№</b> 1	0	20.61
Alb G	18615	-6	AB	1	7.4	20.51
MIC		QLA.	OBL W	1.00	14	20.50
AB		WO'S	16-QAM	8	0	20.15
NORL		QL.All	MORLE	8	4	20.14
A. A.E		MOL	3	8	7	20.04
MORI		all al	ORL	15	0	19.42
. 60	LAR	The World	. 6	- ARE 1	0 1	21.68
AL	"O'ST. MIC	60	alar a	1	7.3	21.61
G 10.		ORLAN	01. 2 4.	1,000	14	21.57
2LAL		ME	QPSK	8	0	20.58
NOF		ORLAN	MOL	8	4 4	20.53
al.Al	M	MIC	B ZLA	8	7	20.61
	0	AB too ORL	MOL	15	0	20.55
3MHz		1880	RIAB	21.h 1	0 411	20.54
NO.	18900			1.0	7	20.68
3		"OBT	13	21	14	20.61
ORLAN		W. VE	16-QAM	8	0	20.18
ILC VE		ORL	Mo	8 📣	4.01	20.13
ORLAN		S. Mr.	E SELL	8	7	20.15
ME		LAD	Mo	× 15	0	19.53
AB O	The Mo	A W	AB	1	0 4	21.49
Mc		QLAE.	OFFE MI	1.0	7	21.64
AB		WOL T	AB	0.1	14	21.53
ORL		2LAB	QPSK	8	0	20.51
a. AE		Morr	S III.	8	4	20.64
NORL	H	a a	AORL	8	<i>№</i> 7	20.59
S W.	AB A	1000 41010	S. W.	15	0 1	20.53
A		1908.5	QLA.	1	0.5	20.49
the same	19185	RLA	Die W	100	7	20.68
2LAE		We To	LAB	OF	14	20.71
NOF	OFF ME	agl. A.	16-QAM	8	0	20.29
LAB		Mo.	B TA	8	4	20.29
MORE		AB al	MORI	8	7	20.18
0		W. Mor		15	0	19.61



Band Width	Channel	Freq.(MHZ)	Modulation	RB Configuration		Average Power
				RB Size	RB Offset	(dBm)
Me	. 6	LAP OR	W.C.	. 9 1	0	21.32
OB		MIC	0B	al. 1	2	21.24
II.		LAB	OPLI	1.0	5	21.28
0.B		MORE	QPSK	3	0	21.45
ORL		II. A.B	ORLA	3	. a 1	21.36
W. OE	-QLA	MORE	Mic	3 📣	2	21.37
ORL	Mo.	4050.7	E ORL	6	0	20.32
P.T.		1850.7	lin.	<b>№</b> 1	0	20.65
Als o	18607	-0	ALAE	1	2	20.62
MIC		QLA.	Okr W	1.00	5	20.63
LAB		WO.	16-QAM	3	0	20.15
MORE		QL.A.	MORE	3	5 1 al	20.29
LAE		MO	e . A	3	2	20.25
		AB QL	MORL	6	0	19.34
.0	LAP O	in Mo.	. 6	LAW 1	0	21.43
AL		a.B	QLAP .	1	2	21.42
. 6		ORLE	0, 8	1.00	5	21.42
R.L.A.		ME	QPSK	3	0	21.5
NO.		ORL	Mor	3	P LORL	21.47
QLA.	M	M	G QLA	3	2	21.49
1.4MHz	. 6	4000	Mor	6	0	20.48
1.4IVIHZ		1880	SRLAE MC	21.1 1	0	20.5
", Mo	18900			1.0	2	20.45
O.B		"OBT	NB.	1	5	20.43
OPLI		LAE	16-QAM	3	0	20.05
Me all		MORL	ME	3	2	20.04
ORL		0 10	G ORLA	3	5	20.06
M		LAL	MC	<b>6</b>	0	19.3
AB O	Mo.	0,	AB	1	0 0	21.53
Me		RLA	Okr. W.	1.0	2	21.23
LAB		Mo. "	AB	1	5	21.53
MORE		QL.A.	QPSK	3	0	21.61
LAB		MOL	3	3	1	21.59
MORE	Н	all al	MORL	3	<b>∞</b> 2	21.44
. 6	LAP	1000.3		6	0	20.66
A.O.		1909.3	RI.A.	1	0.5	20.17
· · · · · · · · · · · · · · · · · · ·	19193	ORL	D. Bu	1	2	19.91
RLAI		Mr. OB	QLA!	-10 <sup>R</sup>	5	19.74
NO.	OF ME	ORL. M.	16-QAM	3	0 0	19.31
2LAL		Mo	B	3	1	19.25
MOL		AB ARL	MOF	3	2	19.26
.0		Mo	.0	6	0	19.56



#### LTE BAND 7

Band Width	Channel	Freq.(MHZ)	Modulation	RB Configuration		Average Power
				RB Size	RB Offset	(dBm)
Mo	0	Var. Var.	W.	0.1	0	19.75
OB .	al Al	MO	20	all 1	49	19.21
True MC	9 11.	AB	ORLAN MIC	1 0	99	19.51
0	ZLA!	"OBT	QPSK	50	0	18.11
ORLA	MOL	W. AB	QRL. III	50	25	18.10
MIC OF	QLA!	MORLE	IND.	50	49	17.94
ORLAN	MOL	S	B ORLA	100	0	17.98
MIC	AB .	2510	lu.	1	0 -1	18.44
AB	20850	S In.	AB	R. 1 W	49	18.11
INC	20	2LAL	OET W	108	99	18.01
AB	RLING	"OL	16-QAM	50	0	17.59
10RL	MC VE	3LAB	*OBT	50	25	17.56
u. VE	ORL. M.	MOL	a Mi	50	49	17.60
JORL	Me	A 01	JORL	100	0	16.68
S bu	. AR	NO.	4	1	O W	20.08
LAB MORLAE INC	20	aLAB 10	1 11	49	20.25	
	AB	ORLAN B	OL MI	1.00	99	20.74
	ME	QPSK	50	0	18.66	
MOL	W. AE	RLA	Molt	50	25	19.25
2LAV	,ORL	MO	G LA	50	49	19.23
- MON	M	AB - ORL	MOLE	100	0	18.85
20MHz	21100	2535	arlae mo	21.h 1 - 1	0 411	18.87
"In MO	21100			1 0	49	19.14
.0	3LAE	*ORT	20	27	99	19.72
ORLAN	MOL	M. AE	16-QAM	50	0	19.20
MC VE	3LAE	ORL	MIC.	50	25	18.91
QRL.ha	MOLE	NI.	B ORLA	50	49	18.93
Mo	3	LAP ORL	Me	100	0 0	17.65
AB	ir. Wo.	4	AB	1 1	0	20.72
MIC	.0	2LAE	ORIE ME	168	49	20.78
AB	CRLIN	"Op."	A.B	P.1	99	20.99
ORL	MC VE	3LAP	QPSK	50	0	19.39
W. VE	SPLIN	MOL	S W. VE	50	25	19.25
MORIL	INC	al al	*ORI	50	49	19.02
B 10.	AB H OF	0500	S W	100	0 116	19.24
A. ao	21350	2560	2LA .0	1 1	0	19.51
D Mr.		agl.A.	OL WILL	100	49	19.55
al At	ORL	MIL TE	2LAB	.40F	99	19.90
HOL	W. VE	RLA	16-QAM	50	0	19.51
LAB	JORL	MO	3 TLAP	50	25	19.43
MOL	d In	AB GRL	MOL	50	49	19.34
.0	LAP	WO.	. 4	100	0 111	17.81



Band Width	Channel	Freq.(MHZ)	Modulation	RB Con	figuration	Average Power
band widin	Chamilei	Freq.(MHZ)		RB Size	RB Offset	
Me	LAT OF	W.	.0.1	0	19.61	
AB	AB SLA	MIC	O.B	all 1	37	19.67
MC		LAB	ORL	1.0	74	19.69
OB		MORE	QPSK	36	0	18.48
ORL		II. AB	ORL	36	18	18.67
M. O.E		MORE	IN OF	36	35	18.57
ORL	LO.	2507.5	S ORL	75	0	17.96
MILE	20825	2507.5	la.	<b>№</b> 1	0	18.89
AB O		. 6	LAB	P. 1 W	37	18.80
MIC		QL.A.	OLE III	100	74	18.69
LAB		MO. B	16-QAM	36	0	18.34
MORE		al A	MORE	36	18	18.28
LAB		Mo.	e "LAF	36	35	18.21
MORE	M	al al	MORE	75	<b>ॐ</b> 0	16.62
. 6	LAL	IN INC.	. 6	AP 1	0	19.97
,A. ano		D.B	QLA"	1 1	37	20.21
. 6		ORL	QPSK	1.00	74	20.64
RI.A.		ME		36	0	18.82
10°		ORL	WO.	36	18	19.34
QLA.		ME	B QLA	36	35	19.42
15MHz	M	2525	MO.	75	0	19.08
ISIVIDZ	21100	2535	OFLAE MC	21.1	0	18.95
", Mo				1.0	37	19.42
N.B				21	74	19.52
ORL			16-QAM	36	0	19.05
III OE		MORE	We of	36	18	19.07
ORLE		. 6	G ORLIN	36	35	18.94
Miles	NB .	LAL	MILE	75	0	18.87
AB	III.	. 6	LAB	1 1	0	20.70
HUS		RLA	Dies We	1.0	37	20.68
LAB		Mo. B	LAB	P1	74	20.83
VOL.		QLA.	QPSK	36	0	19.58
LAB		MO.	S LAF	36	18	19.64
MORE	Н	al al	MORE	36	35	19.65
.0	LAP	2562.5	A	75	0 1116	19.22
ano'		2562.5	RILL	1 1	0	19.12
21375	ORL	D	100	37	19.35	
RLA		W. O'B	RLAI	Off.	74	19.64
Vo.	O. B. W.	ORL	16-QAM	36	0	19.08
R.L.A.		W.	a ala	36	18	19.03
MOL		LAB ORL	Mor	36	35	18.94
.0		M	.0	75	0	17.94



Band Width	Channel	Freq.(MHZ)	Modulation	RB Configuration		Average Power
Baria Wiatri	Chamilei			RB Size	RB Offset	(dBm)
Mo	.0	CUR. OK.	W.	. 40 1	0	19.95
AB	3 ELA	M	AB	all 1	24	19.40
MC		T.A.B	ORL ME	1.0	49	19.43
AB.		Mole	QPSK	25	0	18.47
ORL		LAB	ORL	25	12	18.51
M. O.F.		MORE	a in a	25	24	18.50
ORL	"FO.	2505	No Okli	50	0	18.36
III.	20800	2505	W.	<b>№</b> 1	0	18.48
AB		-0	ALAB C	<sup>Pl</sup> 1 W	24	18.46
lu lu		QLA.	Oles W	1 💖	49	18.53
LAB		Mo.	16-QAM	25	0	18.18
MOLE		RLA	MORE	25	12	18.16
TAR		Wo.	B LA	25	24	18.09
MORE	III.	all al	MOLE	50	<b>ॐ</b> 0	17.00
.0	LAR	MO	. 4	- 1 1	0	20.28
-And		O.B	- RLA	1 - "	24	20.04
.0		ORL	0,	-1	49	20.53
R.L.A.		Mrs. DE	QPSK	25	0	19.16
MO.		ORL	WO.	25	12	19.25
RLA		M	B RLA	25	24	19.29
10MHz	M	2525	WO.	50	0	19.23
TOWINZ	21100	2535	OFLAS MS	al. 1	0 411	18.80
MO				1 0	24	18.69
A.B				1	49	18.90
ORL			16-QAM	25	0	18.25
a.E		MORE	MIC	25	12	18.20
ORL		. 6	DELLE ORLER	25	24	18.21
M	NB o	LAT	Me	50	0	17.96
AE O	in.	.0	aLAB C	1 1	0	20.52
MILE		RLAL	DES. HILL	1.0	24	20.59
CLAB		Mo.	LAB	1	49	20.67
NOK.		-QLA	QPSK	25	0	19.58
LAB		Mo.	3 LAP	25	12	19.53
MORE	Н	AB al	MORE	25	24	19.61
.0		2565	On W	50	0 416	19.29
in another	ME	2505	RILL MO	1 1	0.	19.65
.0	21400	21400	2.	1	24	19.53
RLA		W. O.B.	RLAL	011	49	19.54
Mo.	B W. AB	ORL	16-QAM	25	0	19.05
RLAL		IN.	a ala	25	12	19.08
MO		AB ORL	MO	25	24	19.11
.0		W	.0	50	0 1111	17.97



Band Width	Channel	Freq.(MHZ)	NA - skul - 4i - u	RB Configuration		Average Power
			Modulation	RB Size	RB Offset	(dBm)
alo.	9	AL ORI	W.	0.1	0	19.90
3	AE MOLLAR MO	MIC		all 1	12	19.83
The MO		, AB	ORLAN MIC	1 0	24	19.89
3		ORL	QPSK	12	0	18.74
ORLAN		W. AE	RLL	12	6	18.91
Mr. VE		"OBT	IND.	12	11	18.95
ORLAN	For	9	E ORLIN	25	0	18.44
Me	20775	2502.5	Eu.	<i>№</i> 1	0	18.60
A.B	20110	S W	AB	RL 1 1	12	18.64
MIC		2LAL	ORL MI	100	24	18.66
AB		"IOL	16-QAM	12	0	18.21
ORL		3LAB	ORL	12	6	18.20
u. VE		MOL	o m	12	11	18.09
MORL		all al	ORL	25	0	17.06
S Un.	LAE N	The same	0,	1	0 11	20.19
Ab Okt MO			aLAB .C	1 11	12	19.99
S bu.		ORLAN N	Ole Un.	1.00	24	20.22
M	MIC ORLAG	QPSK	12	0	19.10	
			12	6	19.21	
	MO		12	11	19.18	
	AP OFFICE ORL		25	0	19.14	
5MHz	21100	2535	OFLAE INC	21. Par 1	0 411	18.78
NO NIO	260			1 0	12	18.69
3				21	24	18.91
ORLAN			16-QAM	12	0	18.34
IIIC NE			ME	12	6	18.23
ORLAN		S. Mr.	Balling	12	11	18.20
ME		LAB	Mo	25	0 .00	17.91
AE ~	Fr. MC	0.	AB	22 1 11	0	20.73
Mo		QLAL.	Der We	100	12	20.82
LAB		WO. T.	AB	081	24	21.04
NOR		QLA.	QPSK	12	0	19.93
AB		MOL	a AF	12	6	19.99
MORE		all al	MORL	12	< <b>ॐ</b> 11	19.81
. 6	AP H	2567.5	G	25	0 416	19.28
21425	21425	2567.5	all ac	1 1	0	19.32
· · · · · · · · · · · · · · · · · · ·	LAB	MORLA" AE N	D. 2 41.	1000	12	19.46
RLA			QLA!	-40 <sup>10</sup> 1	24	19.54
MOPE AE		ORLIN	16-QAM	12	0	19.08
QLA!		AB MO.	B QLA	12	6	19.04
MOL			WOL.	12	11	19.11
.0		MIC		25	0	17.73



#### 11. MEASUREMENT OF CONDUCTED OUTPUT POWER

# 1. WCDMA mode conducted output power values

	band	W	CDMA 8	50	W	CDMA 19	900		
Item	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		
Mor	<u>√</u> 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		
HSUPA	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	Channal	Frequency	Output Power(dBm)					
Danu	Channel	(MHz)	Slot 1	Slot 2	Slot 3	Slot 4		
CCM	128	824.2	31.32	30.20	29.16	28.15		
GSM	190	836.6	31.75	30.63	29.59	28.48		
850	251	848.8	31.65	30.53	29.49	28.43		
DCC	512	1850.2	27.96	26.84	25.80	24.79		
PCS 1900	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

YO.			.00		. 50	- 10 - 10		
Band	Channel	Frequency	Output Power(dBm)					
	Chamor	(MHz)	Slot 1	Slot 2	Slot 3	Slot 4		
CCM	128	824.2	22.29	24.18	24.90	25.14		
GSM	190	836.6	22.72	24.61	25.33	25.57		
850	251	848.8	22.62	24.51	25.23	25.47		
DCC	512	1850.2	18.93	20.82	21.54	21.78		
PCS	661	1880.0	18.95	20.84	21.56	21.80		
1900	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

Dand	Chana al	Frequency		Output P	ower(dBm)	
Band	Channel	(MHz)	Slot 1	Slot 2	Slot 3	Slot 4
0014	128	824.2	27.92	26.90	25.85	24.84
GSM	190	836.6	27.65	26.63	25.58	24.57
850	251	848.8	27.88	26.86	25.81	24.80
DOC	512	1850.2	25.55	24.53	23.48	22.47
PCS	661	1880.0	25.63	24.61	23.56	22.55
1900	810	1909.8	25.77	24.75	23.70	22.69



#### **EDGE Time-based Average Power**

		70			.01			
Band	Channel	Frequency	Output Power(dBm)					
200	Onamor	(MHz)	Slot 1	Slot 2	Slot 3	Slot 4		
0014	128	824.2	18.89	20.88	21.59	21.83		
GSM	190	836.6	18.62	20.61	21.32	21.56		
850	251	848.8	18.85	20.84	21.55	21.79		
DCC	512	1850.2	16.52	18.51	19.22	19.46		
PCS 1900	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: 2	21.0~23.8°	C, humidity: 54~60%	. MORE	NIC AE	RLAR	MORE	Mo
Phanto Configura	0.	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	ORLAB INC	0.771	1.005	0.775	1	
	Horizontal-Down		0.729		0.733	"IO	
	Vertical-Front	190	0.554		0.557	B	
	Vertical-Back	MORE	0.566		0.569	0.	

Summary of Measurement Results (GSM 1900MHz Band)

Temperature: 2	21.0~23.8°	C, humidity: 54~60%	IN LAF	ORLA	MORE	NI NI	AB
Phanto Configura	Jan .	Device Test Positions	Device Test channel	SAR(W/Kg), 1g Peak	Scaling Factor	Scaled SAR (W/Kg), 1g	Plot No.
Chip ORLAN	Horizontal-Up	ZLAB	0.444	00	0.445	.0R	
Body	a Li	Horizontal-Down	11012	0.769	4.000	0.771	2
(5mm Separation)	GPRS	Vertical-Front	810	0.141	1.002	0.141	
Separation)	A.E	Vertical-Back	VB MIL	0.172	MOL	0.172	TLAB

#### 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 10	1:2
GPRS1900	810	4	0	1:2

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%	).	LAB	OPLA	WOE S	
Phantom Configurations	Device Test Positions	Device Test channel	SAR(W/Kg), 1g Peak	Scaling Factor	Scaled SAR (W/Kg), 1g	Plot No.
Body	Horizontal-Up	-0 H	0.515	MO	0.520	al AB
(5mm Separation)	Horizontal-Down	4422	0.556	4.000	0.561	3
	Vertical-Front	4132	0.243	1.009	0.245	40 <sup>8</sup>
	Vertical-Back	MOL	0.214	OPLA	0.216	8

### Summary of Measurement Results (WCDMA 1900MHz Band)

Phantom Configurations	Device Test Positions	Device Test channel	SAR(W/Kg), 1g Peak	Scaling Factor	Scaled SAR (W/Kg), 1g	Plot No.
AE MORLA	NOT NO STATE	9262	0.890	1.197	1.065	ORL
Body	Horizontal-Up	9400	1.043	1.099	1.146	4
(5mm Separation)	SE W. SLAE	9538	0.898	1.189	1.068	1110
	Horizontal-Down	QLAB	0.605	Wo.	0.665	No.
	Vertical-Front	9400	0.517	1.099	0.568	.0
	Vertical-Back	LAE	0.190		0.209	ORL

#### 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.



- BT & WiFi SAR test is conducted according to section 12 stand-alone SAR evaluation of this
  report.
- 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: 2	21.0~23.8	°C, humidity: 54~60%	).	LAB	ORLAN	Moles &	in-
Phanto Configura		Device Test Positions	Device Test channel	SAR(W/Kg), 1g Peak	Scaling Factor	Scaled SAR (W/Kg), 1g	Plot No.
AB _ AB	Horizontal-Up	10	0.673	MO	0.750	5	
Body		Horizontal-Down	ALA MO	0.457	OLA B	0.509	O.
(5mm Separation)	Vertical-Front	18900	0.215	1.114	0.240	,o <sup>R</sup>	
	Vertical-Back	MOL	0.188	OPLA	0.209	0 40	

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

Temperature: 2	21.0~23.8	°C, humidity: 54~60%	. Mor	W. STAB	ORLA	Mole	S W
Phanto Configura	.0	Device Test Positions	Device Test channel	SAR(W/Kg), 1g Peak	Scaling Factor	Scaled SAR (W/Kg), 1g	Plot No.
Body (5mm Separation)	m no Ri	Horizontal-Up	18900	0.520	1.059	0.551	
		Horizontal-Down		0.348		0.369	Wo.
		Vertical-Front		0.194		0.205	
	S. III	Vertical-Back	WO.	0.151	AB NOF	0.160	.0

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: 2	21.0~23.8°	C, humidity: 54~60%	les the	LAB	ORLAN	WOE N	lie.
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)	) RLAE	Horizontal-Up	21100	0.614	1.002	0.615	LAB
		Horizontal-Down		0.723		0.724	6
		Vertical-Front		0.166		0.166	.05
		Vertical-Back	MOL	0.108	OPLA	0.108	8 40.

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

Temperature: 2	1.0~23.8°	C, humidity: 54~60%	LAE	ORLA	OF	W. STAB	۰۵۶
Phantor Configurat	40	Device Test Positions	Device Test channel	SAR(W/Kg), 1g Peak	Scaling Factor	Scaled SAR (W/Kg), 1g	Plot No.
Body (5mm Separation)	ORLAS W	Horizontal-Up	21100	0.457	1.025	0.468	ORLA
		Horizontal-Down		0.641		0.657	0
		Vertical-Front		0.148		0.152	W.
	MORL	Vertical-Back	CLAB	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	AE ORLAND MORE THE AE	22.72	1.197
	Max output power =22.5(+1/-2)	23.09	1.099
	TRIAL MORL MO	22.76	1.186
LTE BAND2	Max output power =22+-0.5(1RB)	22.03	1.114
(QPSK)	Max output power =20.5+-0.5(50RB)	20.76	1.059
LTE BAND7	Max output power =20.5+-0.5(1RB)	20.99	1.002
(QPSK)	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.

	Test		Meas.S	AR(W/kg)	Largest to Smallest SAR	
Band		Test Channel	Original	Donostod		
	Position		Original	Repeated	Ratio	
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	Туре	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 \*\*\*\*\*