



FCC SAR TEST REPORT

Report No.: SET2016-11965

Product: LTE USB Modem

Brand Name: ZTE

Model No.: MF831

FCC ID: SRQ-MF831

Applicant: ZTE Corporation

Address: ZTE Plaza, Keji Road South, Shenzhen, China

Issued by: CCIC-SET

Lab Location: Electronic Testing Building, Shahe Road, Xili, Nanshan District, Shenzhen, 518055, P. R. China

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Test Report

Product.: LTE USB Modem
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Applicant.....: ZTE Corporation
Applicant Address.....: ZTE Plaza, Keji Road South, Shenzhen, China
Manufacturer.....: ZTE Corporation
Manufacturer Address: ZTE Plaza, Keji Road South, Shenzhen, China

Test Standards.....: **47CFR § 2.1093-** Radiofrequency Radiation Exposure Evaluation: Portable Devices;
ANSI C95.1-1992: Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz – 300 GHz.(IEEE Std C95.1-1991)
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

Test Result.....: Pass

Tested by  2016-07-08
Chun Mei, Test Engineer

Reviewed by.....:  2016-07-08
Shuangwen Zhang, Senior Engineer

Approved by.....:  2016-07-08
Wu Li'an , Manager

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1. GENERAL CONDITIONS

1.1 This report only refers to the item that has undergone the test.

1.2 This report standalone does not constitute or imply by its own an approval of the product by the certification Bodies or competent Authorities.

1.3 This document is only valid if complete; no partial reproduction can be made without written approval of CCIC-SET

1.4 This report cannot be used partially or in full for publicity and/or promotional purposes without previous written approval of CCIC-SET and the Accreditation Bodies, if it applies.



2. Administrative Date

2.1. Identification of the Responsible Testing Laboratory

Company Name: CCIC-SET

Department: EMC & RF Department

Address: Electronic Testing Building, Shahe Road, Nanshan District,
ShenZhen, P. R. China

Telephone: +86-755-26629676

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Responsible Test Lab Managers: Mr. Wu Li'an

2.2. Identification of the Responsible Testing Location(s)

Company Name: CCIC-SET

Address: Electronic Testing Building, Shahe Road, Nanshan District,
Shenzhen, P. R. China

2.3. Organization Item

CCIC-SET Report No.: SET2016-11965

CCIC-SET Project Leader: Mr. Li Sixiong

CCIC-SET Responsible for accreditation scope: Mr. Wu Li'an

Start of Testing: 2016-07-04

End of Testing: 2016-07-07

2.4. Identification of Applicant

Company Name: ZTE Corporation

Address: ZTE Plaza, Keji Road South, Shenzhen, China

2.5. Identification of Manufacture

Company Name: ZTE Corporation

Address: ZTE Plaza, Keji Road South, Shenzhen, China

Notes: This data is based on the information by the applicant.

3. Equipment Under Test (EUT)

3.1. Identification of the Equipment under Test

Sample Name: LTE USB Modem

Model Name: MF831

Brand Name: ZTE

General description:	Support Band	GSM850MHz/1900MHz/900MHz/1800MHz WCDMA 2100MHz/850MHz/1700MHz/1900MHz, LTE Band1/2/4/5/7
	Test Band	GSM 850MHz/ GSM 1900MHz, GPRS 850MHz/ GPRS 1900MHz, WCDMA 850MHz/1700MHz /1900MHz, LTE Band 2/4/5/7
	Multislot Class	GPRS: Class 12; EGPRS: Class 12
	GPRS Class	Class B
	Development Stage	Identical Prototype
	Accessories	Power Supply
	Antenna type	Inner Antenna
	Operation mode	GSM / GPRS /WCDMA / LTE
	Modulation mode	GSM(GMSK),UMTS(QPSK),LTE(QPSK,16QAM),
	Max. RF Power	32.65dBm
	Max. SAR Value	Body-Worn: 1.000W/kg;

NOTE:

- The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.
- This device supports GPRS operation up to class12 (max.uplin:4, max.downlink:4, total timeslots:5). This device supports EDGE operation up to class12(max.uplin:4, max.downlink:4, total timeslots:5)

4 SAR SUMMARY

Highest Standalone SAR Summary

Exposure Position	Frequency Band	Scaled 1g-SAR(W/kg)	Highest Scaled 1g-SAR(W/kg)
Body-Support (5mm Gap)	GSM850	0.721	1.000
	GSM1900	0.230	
	WCDMA Band V	0.603	
	WCDMA Band IV	1.000	
	WCDMA Band II	0.579	
	LTE Band 2	0.520	
	LTE Band 4	0.586	
	LTE Band 5	0.333	
	LTE Band 7	0.450	

5 Specific Absorption Rate (SAR)

5.1 Introduction

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

5.2 SAR Definition

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

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

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

SAR measurement can be either related to the temperature elevation in tissue by

$$\text{SAR} = C \frac{\delta T}{\delta t}$$

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

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

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.

5.3 Phantoms

The phantom used for all tests i.e. for both system checks and device testing, was the twin-headed "SAM Phantom", manufactured by SATIMO. The SAM twin phantom is a fiberglass shell phantom with 2mm shell thickness (except the ear region, where shell thickness increases to 6mm).

System checking was performed using the flat section, whilst Head SAR tests used the left and right head profile sections. Body SAR testing also used the flat section between the head profiles.

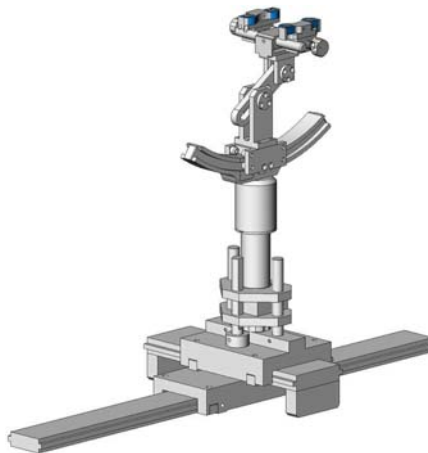


SAM Twin Phantom

5.4 Device Holder

The device was placed in the device holder (illustrated below) that is supplied by SATIMO as an integral part of the COMOSAR test system.

The device holder is designed to cope with the different positions given in the standard. It has two scales for device rotation (with respect to the body axis) and device inclination (with respect to the line between the ear reference points). The rotation centers for both scales is the ear reference point (ERP). Thus the device needs no repositioning when changing the angles.



Device holder

5.5 Probe Specification

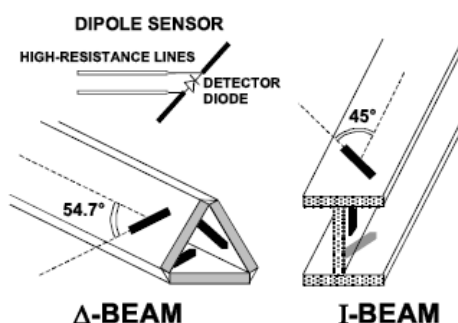


Construction	Symmetrical design with triangular core Interleaved sensors Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Calibration	ISO/IEC 17025 calibration service available.
Frequency	700 MHz to 3 GHz; Linearity: ± 0.5 dB (700 MHz to 3 GHz)
Directivity	± 0.25 dB in HSL (rotation around probe axis) ± 0.5 dB in tissue material (rotation normal to probe axis)
Dynamic Range	1.5 μ W/g to 100 mW/g; Linearity: ± 0.5 dB
Dimensions	Overall length: 330 mm (Tip: 20 mm) Tip diameter: 5 mm Distance from probe tip to dipole centers: <2.7 mm
Application	General dosimetry up to 3 GHz Dosimetry in strong gradient fields Compliance tests of LTE USB Modems
Compatibility	COMOSAR

Isotropic E-Field Probe

The isotropic E-Field probe has been fully calibrated and assessed for isotropicity, and boundary effect within a controlled environment. Depending on the frequency for which the probe is calibrated the method utilized for calibration will change.

The E-Field probe utilizes a triangular sensor arrangement as detailed in the diagram below:



6 OPERATIONAL CONDITIONS DURING TEST

6.1 Schematic Test Configuration

During SAR test, EUT was operating in Traffic Mode (Channel Allocated) at Normal Voltage Condition. A communication link is set up with a System Simulator (SS) by air link, and a call is established. The EUT was commanded to operate at maximum transmitting power.

The EUT should use its internal transmitter. The antenna(s), battery and accessories shall be those specified by the manufacturer. The EUT battery must be fully charged and checked periodically during the test to ascertain uniform power output. If a wireless link was used, the antenna connected to the output of the base station simulator shall be placed at least 50 cm away from the handset.

The signal transmitted by the simulator to the antenna feeding point should be lower than the output power level of the handset by at least 35 dB

6.2 SAR Measurement System

The SAR measurement system being used is the SATIMO system, the system is controlled remotely from a PC, which contains the software to control the robot and data acquisition equipment. The software also displays the data obtained from test scans.

In operation, the system first does an area (2D) scan at a fixed depth within the liquid from the inside wall of the phantom. When the maximum SAR point has been found, the system will then carry out a 3D scan centred at that point to determine volume averaged SAR level.

6.2.1 Tissue Dielectric Parameters for Head and Body Phantoms

The head tissue dielectric parameters recommended by the IEEE SCC-34/SC-2 in P1528 have been incorporated in the following table. These head parameters are derived from planar layer models simulating the highest expected SAR for the dielectric properties and tissue thickness Power drifts in a human head. Other head and body tissue parameters that have not been specified in P1528 are derived from the tissue dielectric parameters computed from the 4-Cole-Cole equations described in Reference [12] and extrapolated according to the head parameters specified in P1528.

Table 1: Recommended Dielectric Performance of Tissue

Ingredients (% by weight)	Frequency (MHz)											
	450		835		915		1900		2450		2600	
Tissue Type	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body
Water	38.56	51.16	41.46	52.4	41.05	56.0	54.9	40.4	62.7	73.2	55.24	64.49
Salt (Nacl)	3.95	1.49	1.45	1.4	1.35	0.76	0.18	0.5	0.5	0.04	0.5	0.024
Sugar	56.32	46.78	56.0	45.0	56.5	41.76	0.0	58.0	0.0	0.0	0.0	0.0
HEC	0.98	0.52	1.0	1.0	1.0	1.21	0.0	1.0	0.0	0.0	0.0	0.0



Bactericide	0.19	0.05	0.1	0.1	0.1	0.27	0.0	0.1	0.0	0.0	0.0	0.0
Triton x-100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.8	0.0	44.45	32.25
DGBE	0.0	0.0	0.0	0.0	0.0	0.0	44.92	0.0	0.0	26.7	0.0	26.7
Dielectric Constant	43.42	58.0	42.54	56.1	42.0	56.8	39.9	54.0	39.8	52.5	39.0	52.5
Conductivity (s/m)	0.85	0.83	0.91	0.95	1.0	1.07	1.42	1.45	1.88	1.78	1.96	2.16

MSL/HSL750 (Body and Head liquid for 650 – 850 MHz)

Item	Head Tissue Simulation Liquid HSL750 Muscle(body)Tissue Simulation Liquid MSL750			
H2O	Water, 35 – 58%			
Sucrose	Sugar, white, refined, 40-60%			
NaCl	Sodium Chloride, 0-6%			
Hydroxyethyl-cellulose	Medium Viscosity (CAS# 9004-62-0), <0.3%			
Preventol-D7	Preservative: aqueous preparation, (CAS# 55965-84-9), containing 5-chloro-2-methyl-3(2H)-isothiazolone and 2-methyl-3(2H)-isothiazolone, 0.1-0.7%			
Frequency (MHz)	Head ϵ_r	Head σ (S/m)	Body ϵ_r	Body σ (S/m)
750	41.9	0.89	55.2	0.97

Note: The liquid of 700MHz&2600MHz typical liquid composition is provided by SATIMO.

Table 2 Recommended Tissue Dielectric Parameters

Frequency (MHz)	Head Tissue		Body Tissue	
	ϵ_r	σ (S/m)	ϵ_r	σ (S/m)
150	52.3	0.76	61.9	0.80
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
835	41.5	0.90	55.2	0.97
900	41.5	0.97	55.0	1.05
915	41.5	0.98	55.0	1.06
1450	40.5	1.20	54.0	1.30
1610	40.3	1.29	53.8	1.40
1800-2000	40.0	1.40	53.3	1.52
2450	39.2	1.80	52.7	1.95
3000	38.5	2.40	52.0	2.73
5800	35.3	5.27	48.2	6.00

6.2.2 Simulate liquid

For body measurements, the EUT was tested against flat phantom representing the user body. Stimulate liquid that are used for testing at frequencies of GSM 850MHz/1900MHz, WCDMA850MHz/1700MHz/1900MHz, LTE Band2/4/5/7, which are made mainly of sugar, salt and water solutions may be left in the phantoms.

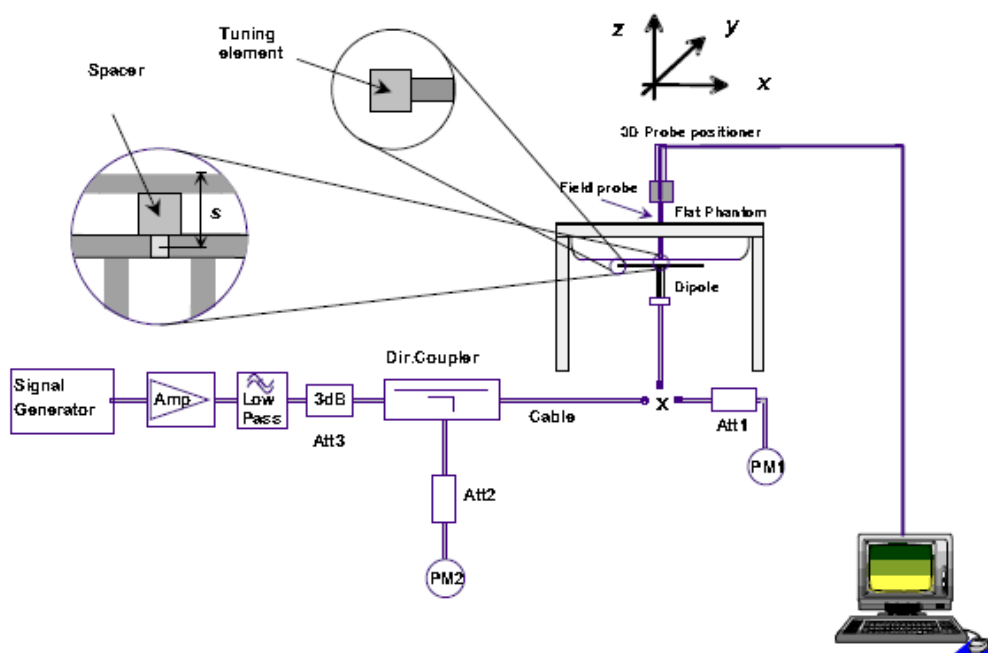
Table 3: Dielectric Performance of Body Tissue Simulating Liquid

Temperature: 23.2°C; Humidity: 64%;			
/	Frequency	Permittivity ϵ	Conductivity σ (S/m)
Target value	850MHz	$55.2 \pm 5\%$	$0.97 \pm 5\%$
Validation value (July 04th, 2016)	850MHz	55.08	0.97
Target value	1800 MHz	$53.3 \pm 5\%$	$1.52 \pm 5\%$
Validation value (July 05th, 2016)	1800 MHz	53.12	1.51
Target value	1900MHz	$53.3 \pm 5\%$	$1.52 \pm 5\%$
Validation value (July 05th, 2016)	1900MHz	53.11	1.52
Target value	2600MHz	$52.5 \pm 5\%$	$2.16 \pm 5\%$
Validation value (July 07th, 2016)	2600MHz	52.37	2.15

6.3 Results of validation testing

Prior to the assessment, the system validation kit was used to test whether the system was operating within its specifications of $\pm 10\%$. The validation results are tabulated below. And also the corresponding SAR plot is attached as well in the SAR plots files.

The following procedure, recommended for performing validation tests using box phantoms is based on the procedures described in the IEEE standard P1528. Setup according to the setup diagram below:



With the SG and Amp and with directional coupler in place, set up the source signal at the

relevant frequency and use a power meter to measure the power at the end of the SMA cable that you intend to connect to the balanced dipole. Adjust the SG to make this, say, 0.25W (24 dBm). If this level is too high to read directly with the power meter sensor, insert a calibrated attenuator (e.g. 10 or 20 dB) and make a suitable correction to the power meter reading.

Note 1: In this method, the directional coupler is used for monitoring rather than setting the exact feed power level. If, however, the directional coupler is used for power measurement, you should check the frequency range and power rating of the coupler and measure the coupling factor (referred to output) at the test frequency using a VNA.

Note 2: Remember that the use of a 3dB attenuator (as shown in Figure 8.1 of P1528) means that you need an RF amplifier of 2 times greater power for the same feed power. The other issue is the cable length. You might get up to 1dB of loss per meter of cable, so the cable length after the coupler needs to be quite short.

Note 3: For the validation testing done using CW signals, most power meters are suitable. However, if you are measuring the output of a modulated signal from either a signal generator or a handset, you must ensure that the power meter correctly reads the modulated signals.

The measured 1-gram averaged SAR values of the device against the phantom are provided in Tables 5 and Table 6. The humidity and ambient temperature of test facility were 64% and 23.2°C respectively. The body phantom were full of the body tissue simulating liquid. The EUT was supplied with full-charged battery for each measurement.

The distance between the back of the EUT and the bottom of the flat phantom is 10 mm (taking into account of the IEEE 1528 and the place of the antenna).

Table 4: Body SAR system validation (1g)

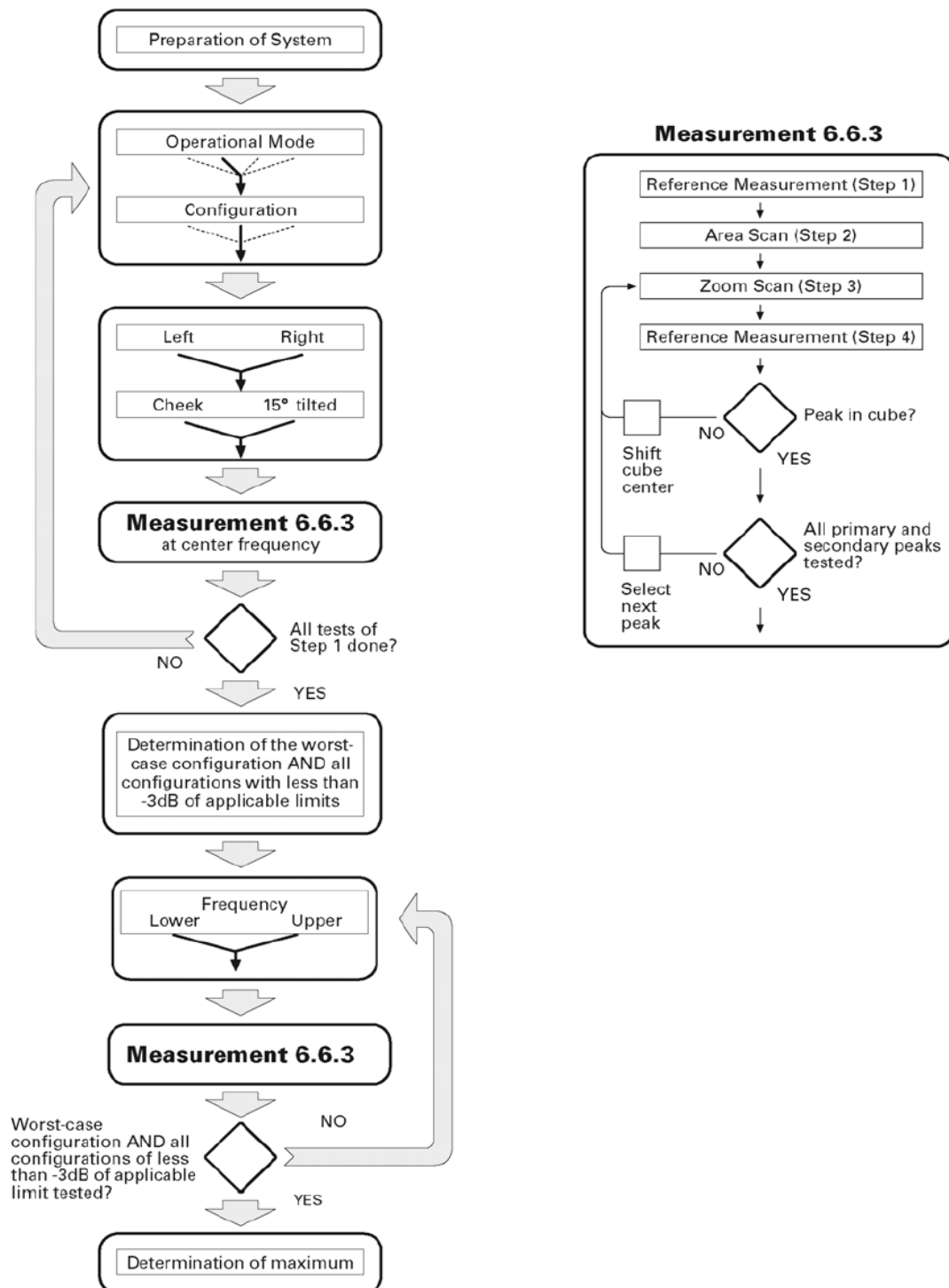
Frequency	Duty cycle	Target value (W/kg)	Test value (W/kg)	
			250 mW	1W
835MHz(July 04th, 2016)	1:1	$10.31 \pm 10\%$	2.52	10.08
1800MHz(July 05th, 2016)	1:1	$40.07 \pm 10\%$	9.87	39.48
1900MHz(July 05th, 2016)	1:1	$40.81 \pm 10\%$	10.15	40.60
2600MHz(July 07th, 2016)	1:1	$57.55 \pm 10\%$	14.06	56.24

* Note: Target value was referring to the measured value in the calibration certificate of reference dipole.

Note: All SAR values are normalized to 1W forward power.

6.4 SAR measurement procedure

The SAR test against the head phantom was carried out as follow:



Establish a call with the maximum output power with a base station simulator, the connection between the EUT and the base station simulator is established via air interface.

After an area scan has been done at a fixed distance of 2mm from the surface of the phantom on the source side, a 3D scan is set up around the location of the maximum spot SAR. First, a point within the scan area is visited by the probe and a SAR reading taken at the start of testing. At the end of testing, the probe is returned to the same point and a

second reading is taken. Comparison between these start and end readings enables the power drift during measurement to be assessed.

Above is the scanning procedure flow chart and table from the IEEE p1528 standard. This is the procedure for which all compliant testing should be carried out to ensure that all variations of the device position and transmission behavior are tested.

6.5 Transmitting antenna information

This EUT was tested in five different USB configurations. They are “USB cable plug-in for configuration 1,2,3 and 4 and Tip Mode(the tip of the EUT) shown as below. All tested with 5mm separation between the particular dongle orientation and the flat phantom.

			
Configuration 1 (Horizontal Up)	Configuration 2 (Horizontal Down)	Configuration 3 (Vertical Front)	Configuration 4 (Vertical Back)

7 CHARACTERISTICS OF THE TEST

7.1 Applicable Limit Regulations

47CFR § 2.1093- Radiofrequency Radiation Exposure Evaluation: Portable Devices;

ANSI C95.1-1992: Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz – 300 GHz.(IEEE Std C95.1-1991)

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

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

7.2 Applicable Measurement Standards

The Specific Absorption Rate (SAR) testing specification, method, and procedure for this is in accordance with the following standards:

FCC 47 CFR Part2 (2.1093)

ANSI/IEEE C95.1-1992

IEEE 1528-2013

FCC KDB 447498 D01 v06 General RF Exposure Guidance

FCC KDB 447498 D02 v02r01 SAR Procedures for Dongle Xmtr

FCC KDB 648474 D04 v01r03 Handset SAR

FCC KDB 865664 D01 v01r04 SAR Measurement 100MHz to 6GHz

FCC KDB 865664 D02 v01r02 SAR Exposure Reporting

FCC KDB 941225 D01 v03r01 3G SAR Procedures

FCC KDB 941225 D05 v02r05 SAR for LTE Devices

FCC KDB 941225 D06 v02r01 Hotspot Mode

FCC KDB 941225 D04 v01 Evaluating SAR for GSM/(E)GPRS Dual Transfer Mode

8 LABORATORY ENVIRONMENTS

The Ambient Conditions during SAR Test

Temperature	Min. = 22 ° C, Max. = 25 ° C
Atmospheric pressure	Min.=86 kPa, Max.=106 kPa
Relative humidity	Min. = 45%, Max. = 75%
Ground system resistance	< 0.5 Ω
Ambient noise is checked and found very low and in compliance with requirement of standards. Reflection of surrounding objects is minimized and in compliance with requirement of standards.	

9. Conducted RF Output Power

9.1 GSM Conducted Power

Band		Burst Average Power (dBm)			Frame-Average Power (dBm)		
GSM850	TX Channel	128	190	251	128	190	251
	Frequency(MHz)	824.2	836.6	848.8	824.2	836.6	848.8
	GPRS (Slot 1)	32.65	32.57	32.36	23.18	23.16	23.24
	GPRS (Slot 2)	30.32	30.25	30.22	24.3	24.23	24.20
	GPRS (Slot 3)	28.45	28.36	28.41	24.19	24.10	24.15
	GPRS (Slot 4)	27.53	27.57	27.42	24.52	24.56	24.41
	EDGE (Slot 1)	26.70	26.72	26.74	17.67	17.69	17.71
	EDGE (Slot 2)	25.33	25.24	25.27	19.31	19.22	19.25
	EDGE (Slot 3)	24.53	24.54	24.47	20.27	20.28	20.21
	EDGE (Slot 4)	23.62	23.56	23.58	20.61	20.55	20.57

Band		Burst Average Power (dBm)			Frame-Average Power (dBm)		
GSM1900	TX Channel	512	661	810	512	661	810
	Frequency(MHz)	1850.2	1880	1909.8	1850.2	1880	1909.8
	GPRS (Slot 1)	28.32	28.51	28.47	19.29	19.48	19.44
	GPRS (Slot 2)	27.65	27.72	27.63	21.63	21.70	21.61
	GPRS (Slot 3)	26.32	26.36	26.27	22.06	22.10	22.01
	GPRS (Slot 4)	25.26	25.31	25.28	22.25	22.3	22.27
	EDGE (Slot 1)	25.13	24.97	24.89	16.10	15.94	15.86
	EDGE (Slot 2)	23.83	23.72	23.76	17.81	17.70	17.74
	EDGE (Slot 3)	22.34	22.28	22.31	18.08	18.02	18.05
	EDGE (Slot 4)	21.66	21.73	21.63	18.65	18.72	18.62

Note: Per KDB 447498 D01 v06, the maximum output power channel is used for SAR testing and for further SAR test reduction.

For hotspot SAR, EUT was performed at GPRS Class 12 multi-slots(4TX) mode

Timeslot consignations

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

9.2 WCDMA Conducted output Power

WCDMA conducted output power

Item	band	WCDMA 850			WCDMA 1700			WCDMA 1900		
	ARFCN	4132	4183	4233	1312	1413	1513	9262	9400	9538
	subtest	dBm			dBm			dBm		
RMC 12.2kbps	non	23.01	22.95	22.89	22.34	22.38	22.40	21.68	21.56	21.57
HSDPA	1	22.25	22.29	22.18	21.85	21.74	21.74	21.08	21.13	21.06
	2	21.55	21.57	21.61	21.71	21.65	21.68	20.89	20.93	20.87
	3	21.32	21.27	21.21	21.49	21.35	21.37	20.78	20.71	20.75
	4	21.27	21.22	21.25	21.24	21.31	21.30	20.48	20.55	20.51
HSUPA	1	22.19	22.21	22.27	21.74	21.77	21.81	21.11	21.19	21.17
	2	21.59	21.61	21.64	21.43	21.52	21.49	20.74	20.69	20.72
	3	21.41	21.55	21.48	21.47	21.45	21.50	20.45	20.47	20.50
	4	21.36	21.33	21.39	21.27	21.31	21.24	20.44	20.48	20.42
	5	21.47	21.39	21.42	21.12	21.15	21.21	20.35	20.28	20.31

Note:

- WCDMA SAR was tested under PMC 12.2kbps with HSPA Inactive per KDB Publication 941225 D01v03r01. HSPA SAR was not required since the average output power of the HSPA subtests was not more than 0.25dB higher than the RMC level and SAR was less than 1.2W/kg.
- It is expected by the manufacturer that MPR for some HSPA subtests may be up to 2dB more than specified by 3GPP, but also as low as 0dB according to the chipset implementation in this model.

9.3 LTE Conducted peak output Power

LTE Test Configurations

The CMW500 Wide Band Radio Communication Tester was used for LTE output power measurements and SAR testing. Closed loop power control was used so the UE transmits with maximum output power during SAR testing. SAR test were performed with the same number of RB and RB offsets transmitting on all frames.

1) Spectrum Plots for RB configurations

A properly configured base station simulator was used for LTE output power measurements and SAR testing. Therefore, spectrum plots for RB configurations were not required to be included in this report.

2) MPR

When MPR is implemented permanently within the UE, regardless of network requirements, only those RB configurations allowed by 3GPP for the channel bandwidth and modulation combinations may be tested with MPR active. Configurations with RB allocations less than the RB thresholds required by 3GPP must be tested without MPR.

The allowed Maximum Power Reduction(MPR) for the maximum output power due to higher order modulation and transmit bandwidth configuration (resource blocks) is specified in Table 6.2.3-1 of the 3GPP TS36.101:

Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 3

Modulation	Channel bandwidth / Transmission bandwidth configuration [RB]						MPR (dB)
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1
16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2

3)A-MPR LTE procedures for SAR testing

A-MPR(Additional MPR) has been disabled for all SAR tests by using Network Signaling Value of “NS_01” on the base station simulator.

4)LTE procedures for SAR testing

A) Largest channel bandwidth standalone SAR test

requirements i) 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 $\leq 0.8\text{W/kg}$, testing of the remaining RB offset configurations and required test channels is not required for 1RB allocation; otherwise, SAR is required for the remaining required test channels and only for the RB offset configuration with the highest output power for that channel. When the reported SAR of a required test channel is $> 1.45\text{ W/kg}$, SAR is required for all three RB offset configurations for that required test channel.

1. LTE Band 2 Conducted Power Test Verdict:

BW(MHz)	Modulation	RB Size	RB Offset	Power(dBm) Low Ch./Freq.	Power(dBm) Middle Ch./Freq.	Power(dBm) High Ch./Freq.
Channel				18700	18900	19100
Frequency(MHz)				1860	1880	1900
20	QPSK	1	0	21.82	21.85	21.89
20		1	49	21.81	21.87	21.82
20		1	99	21.75	21.78	21.75
20		50	0	21.34	21.40	21.39
20		50	24	21.36	21.34	21.30
20		50	49	21.31	21.33	21.37
20		100	0	21.25	21.24	21.30
20	16QAM	1	0	20.82	20.85	20.84
20		1	49	20.77	20.75	20.79
20		1	99	20.72	20.74	20.77
20		50	0	20.35	20.38	20.34
20		50	24	20.39	20.35	20.30
20		50	49	20.37	20.32	20.33
20		100	0	20.32	20.34	20.29
Channel				18675	18900	19125
Frequency(MHz)				1857.5	1880	1902.5
15	QPSK	1	0	21.85	21.81	21.84
15		1	37	21.82	21.80	21.81
15		1	74	21.80	21.83	21.78
15		36	0	21.32	21.35	21.33
15		36	18	21.30	21.33	21.29
15		36	37	21.33	21.27	21.31
15		75	0	21.31	21.29	21.23
15	16QAM	1	0	20.79	20.85	20.74
15		1	37	20.83	20.80	20.79
15		1	74	20.75	20.77	20.74
15		36	0	20.43	20.41	20.42
15		36	18	20.35	20.32	20.39
15		36	37	20.31	20.34	20.41
15		75	0	20.37	20.32	20.38

BW(MHz)	Modulation	RB Size	RB Offset	Power(dBm) Low Ch./Freq.	Power(dBm) Middle Ch./Freq.	Power(dBm) High Ch./Freq.
Channel				18650	18900	19150
Frequency(MHz)				1855	1880	1905
10	QPSK	1	0	21.81	21.83	21.80
10		1	24	21.77	21.79	21.81
10		1	49	21.80	21.77	21.78
10		25	0	21.34	21.39	21.33
10		25	12	21.32	21.35	21.35
10		25	24	21.29	21.30	21.34
10		50	0	21.28	21.25	21.26
10	16QAM	1	0	20.87	20.81	20.80
10		1	24	20.76	20.79	20.81
10		1	49	20.75	20.72	20.78
10		25	0	20.32	20.35	20.34
10		25	12	20.25	20.28	20.32
10		25	24	20.29	20.26	20.28
10		50	0	20.31	20.32	20.30
Channel				18625	18900	19175
Frequency(MHz)				1852.5	1880	1907.5
5	QPSK	1	0	21.78	21.80	21.81
5		1	12	21.77	21.75	21.74
5		1	24	21.74	21.77	21.72
5		12	0	21.31	21.29	21.32
5		12	6	21.32	21.34	21.29
5		12	11	21.31	21.28	21.27
5		25	0	21.24	21.31	21.32
5	16QAM	1	0	20.85	20.82	20.84
5		1	12	20.72	20.81	20.78
5		1	24	20.75	20.80	20.79
5		12	0	20.36	20.34	20.31
5		12	6	20.27	20.25	20.23
5		12	11	20.24	20.21	20.25
5		25	0	20.30	20.25	20.27

BW(MHz)	Modulation	RB Size	RB Offset	Power(dBm) Low Ch./Freq.	Power(dBm) Middle Ch./Freq.	Power(dBm) High Ch./Freq.
Channel				18615	18900	19185
Frequency(MHz)				1851.5	1880	1908.5
3	QPSK	1	0	21.79	21.76	21.77
3		1	7	21.77	21.74	21.75
3		1	14	21.72	21.77	21.72
3		8	0	21.35	21.32	21.30
3		8	4	21.28	21.31	21.26
3		8	7	21.27	21.28	21.25
3		15	0	21.29	21.24	21.23
3	16QAM	1	0	20.86	20.84	20.82
3		1	7	20.82	20.77	20.80
3		1	14	20.78	20.78	20.75
3		8	0	20.32	20.31	20.35
3		8	4	20.35	20.27	20.32
3		8	7	20.24	20.29	20.24
3		15	0	20.27	20.22	20.26
Channel				18607	18900	19193
Frequency(MHz)				1850.7	1732.5	1909.3
1.4	QPSK	1	0	21.77	21.78	21.75
1.4		1	2	21.73	21.72	21.76
1.4		1	5	21.71	21.76	21.74
1.4		3	0	21.34	21.27	21.32
1.4		3	1	21.32	21.28	21.23
1.4		3	2	21.31	21.27	21.26
1.4		6	0	21.28	21.26	21.23
1.4	16QAM	1	0	20.83	20.87	20.85
1.4		1	2	20.85	20.80	20.84
1.4		1	5	20.77	20.82	20.81
1.4		3	0	20.35	20.31	20.37
1.4		3	1	20.34	20.28	20.25
1.4		3	2	20.30	20.27	20.23
1.4		6	0	20.28	20.21	20.24

2. LTE Band 4 Conducted Power Test Verdict:

BW(MHz)	Modulation	RB Size	RB Offset	Power(dBm) Low Ch./Freq.	Power(dBm) Middle Ch./Freq.	Power(dBm) High Ch./Freq.
Channel				20050	20175	20300
Frequency(MHz)				1720	1732.5	1745
20	QPSK	1	0	22.41	22.44	22.43
20		1	49	22.39	22.35	22.39
20		1	99	22.28	22.27	22.25
20		50	0	21.72	21.64	21.67
20		50	24	21.61	21.75	21.71
20		50	49	21.78	21.72	21.75
20		100	0	21.61	21.56	21.57
20	16QAM	1	0	21.12	21.21	21.14
20		1	49	21.10	21.15	21.13
20		1	99	21.14	21.10	21.07
20		50	0	20.57	20.49	20.52
20		50	24	20.49	20.47	20.50
20		50	49	20.51	20.55	20.46
20		100	0	20.54	20.55	20.41
Channel				20025	20175	20325
Frequency(MHz)				1717.5	1732.5	1747.5
15	QPSK	1	0	22.40	22.36	22.38
15		1	37	22.36	22.31	22.32
15		1	74	22.30	22.27	22.23
15		36	0	21.65	21.57	21.59
15		36	18	21.58	21.56	21.57
15		36	37	21.56	21.50	21.54
15		75	0	21.58	21.56	21.62
15	16QAM	1	0	21.22	21.17	21.23
15		1	37	21.20	21.15	21.19
15		1	74	21.09	21.12	21.18
15		36	0	20.56	20.53	20.58
15		36	18	20.59	20.63	20.60
15		36	37	20.41	20.51	20.43
15		75	0	20.52	20.54	20.51

BW(MHz)	Modulation	RB Size	RB Offset	Power(dBm) Low Ch./Freq.	Power(dBm) Middle Ch./Freq.	Power(dBm) High Ch./Freq.
Channel				20000	20175	20350
Frequency(MHz)				1715	1732.5	1750
10	QPSK	1	0	22.32	22.39	22.35
10		1	24	22.25	22.29	22.33
10		1	49	22.24	22.19	22.25
10		25	0	21.64	21.66	21.68
10		25	12	21.72	21.65	21.70
10		25	24	21.57	21.60	21.55
10		50	0	21.55	21.62	21.58
10		16QAM	1	0	21.13	21.15
10	1		24	21.11	21.22	21.15
10	1		49	21.18	21.09	21.16
10	25		0	20.65	20.63	20.70
10	25		12	20.58	20.60	20.62
10	25		24	20.62	20.68	20.64
10	50		0	20.59	20.64	20.53
Channel				19975	20175	20375
Frequency(MHz)				1712.5	1732.5	1752.5
5	QPSK	1	0	22.36	22.31	22.35
5		1	12	22.35	22.32	22.33
5		1	24	22.31	22.23	22.25
5		12	0	21.62	21.57	21.62
5		12	6	21.57	21.60	21.58
5		12	11	21.55	21.53	21.67
5		25	0	21.63	21.58	21.59
5		16QAM	1	0	21.17	21.26
5	1		12	21.21	21.17	21.12
5	1		24	21.19	21.21	21.15
5	12		0	20.65	20.71	20.68
5	12		6	20.56	20.62	20.65
5	12		11	20.65	20.64	20.62
5	25		0	20.53	20.58	20.50

BW(MHz)	Modulation	RB Size	RB Offset	Power(dBm) Low Ch./Freq.	Power(dBm) Middle Ch./Freq.	Power(dBm) High Ch./Freq.
Channel				19965	20175	20385
Frequency(MHz)				1711.5	1732.5	1753.5
3	QPSK	1	0	22.36	22.34	22.38
3		1	7	22.31	22.30	22.33
3		1	14	22.29	22.25	22.27
3		8	0	21.67	21.61	21.56
3		8	4	21.60	21.55	21.58
3		8	7	21.58	21.62	21.65
3		15	0	21.55	21.59	21.61
3	16QAM	1	0	21.21	21.12	21.15
3		1	7	21.17	21.15	21.13
3		1	14	21.12	21.10	21.06
3		8	0	20.63	20.65	20.72
3		8	4	20.54	20.58	20.55
3		8	7	20.63	20.68	20.65
3		15	0	20.62	20.66	20.58
Channel				19957	20175	20393
Frequency(MHz)				1710.7	1732.5	1754.3
1.4	QPSK	1	0	22.35	22.31	22.30
1.4		1	2	22.31	22.30	22.29
1.4		1	5	22.25	22.29	22.23
1.4		3	0	21.61	21.58	21.55
1.4		3	1	21.57	21.63	21.58
1.4		3	2	21.56	21.57	21.61
1.4		6	0	21.55	21.56	21.59
1.4	16QAM	1	0	21.22	21.17	21.19
1.4		1	2	21.13	21.14	21.21
1.4		1	5	21.21	21.12	21.14
1.4		3	0	20.65	20.71	20.67
1.4		3	1	20.59	20.63	20.67
1.4		3	2	20.60	20.58	20.57
1.4		6	0	20.69	20.62	20.63

3. LTE Band 5 Conducted Power Test Verdict:

BW(MHz)	Modulation	RB Size	RB Offset	Power(dBm) Low Ch./Freq.	Power(dBm) Middle Ch./Freq.	Power(dBm) High Ch./Freq.
Channel				20450	20525	20600
Frequency(MHz)				829	836.5	844
10	QPSK	1	0	23.12	23.16	23.15
10		1	24	23.05	23.12	23.13
10		1	49	23.12	23.09	23.10
10		25	0	22.61	22.59	22.64
10		25	12	22.52	22.56	22.60
10		25	24	22.57	22.60	22.55
10		50	0	22.55	22.62	22.58
10	16QAM	1	0	21.93	21.95	21.94
10		1	24	21.91	21.92	21.95
10		1	49	21.88	21.89	21.86
10		25	0	21.35	21.43	21.40
10		25	12	21.38	21.30	21.32
10		25	24	21.32	21.28	21.34
10		50	0	21.30	21.34	21.23
Channel				20425	20525	20625
Frequency(MHz)				826.5	836.5	846.5
5	QPSK	1	0	23.08	23.14	23.10
5		1	12	23.05	23.12	23.06
5		1	24	23.06	23.09	23.10
5		12	0	22.54	22.56	22.52
5		12	6	22.55	22.53	22.51
5		12	11	22.54	22.58	22.55
5		25	0	22.51	22.58	22.52
5	16QAM	1	0	21.89	21.91	21.92
5		1	12	21.92	21.89	21.90
5		1	24	21.86	21.87	21.88
5		12	0	21.35	21.33	21.34
5		12	6	21.28	21.30	21.32
5		12	11	21.25	21.28	21.31
5		25	0	21.27	21.24	21.23

BW(MHz)	Modulation	RB Size	RB Offset	Power(dBm) Low Ch./Freq.	Power(dBm) Middle Ch./Freq.	Power(dBm) High Ch./Freq.
Channel				20415	20525	20635
Frequency(MHz)				825.5	836.5	847.5
3	QPSK	1	0	23.09	23.10	23.06
3		1	7	23.07	23.02	23.06
3		1	14	23.03	23.04	23.07
3		8	0	22.47	22.51	22.46
3		8	4	22.40	22.45	22.48
3		8	7	22.38	22.42	22.45
3		15	0	22.37	22.34	22.41
3	16QAM	1	0	21.81	21.82	21.85
3		1	7	21.87	21.78	21.83
3		1	14	21.72	21.80	21.76
3		8	0	21.43	21.35	21.40
3		8	4	21.34	21.38	21.35
3		8	7	21.33	21.28	21.35
3		15	0	21.32	21.36	21.28
Channel				20407	20525	20643
Frequency(MHz)				824.7	836.5	848.3
1.4	QPSK	1	0	23.07	23.09	23.08
1.4		1	2	23.06	23.07	23.06
1.4		1	5	23.09	23.06	23.05
1.4		3	0	22.51	22.48	22.52
1.4		3	1	22.47	22.53	22.48
1.4		3	2	22.56	22.47	22.51
1.4		6	0	22.47	22.50	22.53
1.4	16QAM	1	0	21.82	21.87	21.89
1.4		1	2	21.83	21.74	21.81
1.4		1	5	21.74	21.82	21.76
1.4		3	0	21.35	21.34	21.35
1.4		3	1	21.29	21.33	21.25
1.4		3	2	21.30	21.28	21.27
1.4		6	0	21.28	21.22	21.23

4. LTE Band 7 Conducted Power Test Verdict:

BW(MHz)	Modulation	RB Size	RB Offset	Power(dBm) Low Ch./Freq.	Power(dBm) Middle Ch./Freq.	Power(dBm) High Ch./Freq.
Channel				20850	21100	21350
Frequency(MHz)				2510	2535	2560
20	QPSK	1	0	21.72	21.79	21.74
20		1	49	21.75	21.77	21.73
20		1	99	21.71	21.72	21.75
20		50	0	21.32	21.34	21.37
20		50	24	21.37	21.35	21.31
20		50	49	21.38	21.29	21.35
20		100	0	21.35	21.30	21.33
20	16QAM	1	0	21.10	21.11	21.12
20		1	49	21.08	21.12	21.13
20		1	99	21.04	21.07	21.08
20		50	0	20.77	20.75	20.72
20		50	24	20.69	20.67	20.70
20		50	49	20.64	20.61	20.66
20		100	0	20.70	20.65	20.71
Channel				20825	21100	21375
Frequency(MHz)				2507.5	2535	2562.5
15	QPSK	1	0	21.73	21.76	21.71
15		1	37	21.72	21.75	21.75
15		1	74	21.71	21.72	21.74
15		36	0	21.35	21.33	21.36
15		36	18	21.32	21.31	21.32
15		36	37	21.35	21.37	21.36
15		75	0	21.34	21.33	21.35
15	16QAM	1	0	21.12	21.13	21.09
15		1	37	21.04	21.05	21.05
15		1	74	21.07	21.04	21.07
15		36	0	20.75	20.74	20.79
15		36	18	20.69	20.68	20.72
15		36	37	20.65	20.66	20.64
15		75	0	20.71	20.65	20.67

BW(MHz)	Modulation	RB Size	RB Offset	Power(dBm) Low Ch./Freq.	Power(dBm) Middle Ch./Freq.	Power(dBm) High Ch./Freq.
Channel				20800	21100	21400
Frequency(MHz)				2505	2535	2565
10	QPSK	1	0	21.72	21.75	21.71
10		1	24	21.74	21.73	21.73
10		1	49	21.74	21.73	21.71
10		25	0	21.34	21.38	21.35
10		25	12	21.32	21.34	21.32
10		25	24	21.35	21.37	21.38
10		50	0	21.33	21.32	21.35
10	16QAM	1	0	21.13	21.10	21.09
10		1	24	21.07	21.02	21.11
10		1	49	21.05	21.10	21.05
10		25	0	20.70	20.64	20.63
10		25	12	20.61	20.65	20.64
10		25	24	20.55	20.50	20.55
10		50	0	20.50	20.55	20.53
Channel				20775	21100	21425
Frequency(MHz)				2502.5	2535	2567.5
5	QPSK	1	0	21.70	21.73	21.72
5		1	12	21.71	21.70	21.71
5		1	24	21.72	21.71	21.69
5		12	0	21.35	21.35	21.32
5		12	6	21.34	21.35	21.30
5		12	11	21.33	21.35	21.30
5		25	0	21.32	21.60	21.32
5	16QAM	1	0	21.10	21.14	21.13
5		1	12	21.05	21.12	21.07
5		1	24	21.09	21.04	21.08
5		12	0	20.74	20.70	20.72
5		12	6	20.65	20.61	20.70
5		12	11	20.65	20.66	20.60
5		25	0	20.59	20.60	20.67

General Note:

1. Per KDB 447498 D01v06, the reported SAR is the measured SAR value adjusted for maximum tune-up tolerance.
2. Per KDB447498 D01v06, testing of other required channels within the operating mode of a frequency band is not required when the reported 1-g or 10-g SAR for the mid-band or highest output power channel is: ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz. When the maximum output power variation across the required test channels is $> \frac{1}{2}$ dB, instead of the middle channel, the highest output power channel must be used.
3. Per KDB941225 D06 v02r01, the DUT Dimension is bigger than 9 cm x 5 cm, so 10mm is chosen as the test separation distance for Hotspot mode. When the antenna-to-edge distance is greater than 2.5cm, such position does not need to be tested. As the manufacture required, the separation distance use 5mm for Hotspot mode.
4. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥ 0.8 W/Kg; if the deviation among the repeated measurement is $\leq 20\%$, and the measured SAR < 1.45 W/Kg, only one repeated measurement is required.
5. Per KDB865664 D02 v01r02, SAR plot is only required for the highest measured SAR in each exposure configuration, wireless mode and frequency band combination; Plots are also required when the measured SAR is > 1.5 W/kg, or > 7.0 W/kg for occupational exposure. The published RF exposure KDB procedures may require additional plots; for example, to support SAR to peak location separation ratio test exclusion and/or volume scan post-processing(Refer to appendix D for details).
6. Per KDB941225 D04 v01, when multiple slots can be used, the GPRS/EDGE slot configuration with the highest frame-averaged output power was selected for SAR testing.
7. Per KDB941225 D01 v03r01, when the maximum output power and tune-up tolerance specified for production units in a secondary mode is $\leq \frac{1}{4}$ dB higher than the primary mode or when the highest reported SAR of the primary mode is scaled by the ratio of specified maximum output power and tune-up tolerance of secondary to primary mode and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for the secondary mode.
8. FCC KDB 447498 D02 v02r01 SAR Procedures for Dongle Xmtr

9.3. Scaling Factor calculation

Operation Mode	Channel	Output Power(dBm)	Tune up Power in tolerance(dBm)	Scaling Factor
GPRS 850(4Tx)	128	27.53	27.0 $\pm$ 1.0	1.114
	190	27.57	27.0 $\pm$ 1.0	1.104
	251	27.42	27.0 $\pm$ 1.0	1.143
GPRS1900(4Tx)	512	25.26	24.5 $\pm$ 1.0	1.057
	661	25.31	24.5 $\pm$ 1.0	1.045
	810	25.28	24.5 $\pm$ 1.0	1.052
WCDMA850	4132	23.01	22.5 $\pm$ 1.0	1.119
	4183	22.95	22.5 $\pm$ 1.0	1.135
	4233	22.89	22.5 $\pm$ 1.0	1.151
WCDMA1700	1312	22.34	21.5 $\pm$ 1.0	1.038
	1413	22.38	21.5 $\pm$ 1.0	1.028
	1513	22.40	21.5 $\pm$ 1.0	1.023
WCDMA1900	9262	21.68	21.0 $\pm$ 1.0	1.076
	9400	21.56	21.0 $\pm$ 1.0	1.107
	9538	21.57	21.0 $\pm$ 1.0	1.104
LTE B2 20MHz 1RB#0	18700	21.82	21.0 $\pm$ 1.0	1.042
	18900	21.85	21.0 $\pm$ 1.0	1.035
	19100	21.89	21.0 $\pm$ 1.0	1.026
LTE B2 20MHz 50RB#0	18700	21.34	20.5 $\pm$ 1.0	1.038
	18900	21.40	20.5 $\pm$ 1.0	1.023
	19100	21.39	20.5 $\pm$ 1.0	1.026
LTE B4 20MHz 1RB#0	20050	22.41	22.0 $\pm$ 1.0	1.146
	20175	22.44	22.0 $\pm$ 1.0	1.138
	20300	22.43	22.0 $\pm$ 1.0	1.140
LTE B4 20MHz 50RB#49	20050	21.78	21.0 $\pm$ 1.0	1.052
	20175	21.72	21.0 $\pm$ 1.0	1.067
	20300	21.75	21.0 $\pm$ 1.0	1.059
LTE B5 10MHz 1RB#0	20450	23.12	22.5 $\pm$ 1.0	1.091
	20525	23.16	22.5 $\pm$ 1.0	1.081
	20600	23.15	22.5 $\pm$ 1.0	1.084
LTE B5 10MHz 25RB#0	20450	22.61	22.0 $\pm$ 1.0	1.094
	20525	22.59	22.0 $\pm$ 1.0	1.099
	20600	22.64	22.0 $\pm$ 1.0	1.086
LTE B7 20MHz 1RB#0	20850	21.72	21.0 $\pm$ 1.0	1.067
	21100	21.79	21.0 $\pm$ 1.0	1.050
	21350	21.74	21.0 $\pm$ 1.0	1.062
LTE B7 20MHz 50RB#49	20850	21.38	20.5 $\pm$ 1.0	1.028
	21100	21.29	20.5 $\pm$ 1.0	1.050
	21350	21.35	20.5 $\pm$ 1.0	1.035

Note: for LTE power tolerance, only QPSK modulation mode was provide here.

10 TEST RESULTS

10.1 Summary of SAR Measurement Results

Table 7: SAR Values of GSM 850MHz Band

Temperature: 23.0~23.5°C, humidity: 62~64%.						
Test Position of Body With 5 mm		Channel /Frequency (MHz)	SAR(W/Kg), 1.6 (1g average)			Plot No.
			SAR (W/Kg),1g	Scaled Factor	Scaled SAR(W/Kg),1g	
GPRS (4Tx)	Horizontal Up	190/836.6	0.653	1.104	0.721	1
	Horizontal Down	190/836.6	0.366	1.104	0.404	--
	Vertical Back	190/836.6	0.252	1.104	0.278	--
	Vertical Front	190/836.6	0.062	1.104	0.068	--
	Tip Mode	190/836.6	0.018	1.104	0.020	--

Table 8: SAR Values of GSM1900 MHz Band

Temperature: 23.0~23.5°C, humidity: 62~64%.						
Test Position of Body With 5 mm		Channel /Frequency (MHz)	SAR(W/Kg), 1.6 (1g average)			Plot No.
			SAR (W/Kg),1g	Scaled Factor	Scaled SAR(W/Kg),1g	
GPRS (4Tx)	Horizontal Up	661/1880.0	0.220	1.045	0.230	2
	Horizontal Down	661/1880.0	0.194	1.045	0.203	--
	Vertical Back	661/1880.0	0.133	1.045	0.139	--
	Vertical Front	661/1880.0	0.048	1.045	0.050	--
	Tip Mode	661/1880.0	0.018	1.045	0.019	--

Table 9: SAR Values of WCDMA850

Temperature: 23.0~23.5°C, humidity: 62~64%.						
Test Position of Body With 5 mm		Channel /Frequency (MHz)	SAR(W/Kg), 1.6 (1g average)			Plot No.
			SAR (W/Kg),1g	Scaled Factor	Scaled SAR(W/Kg),1g	
Horizontal Up		4183/836.6	0.531	1.135	0.603	3
Horizontal Down		4183/836.6	0.379	1.135	0.430	--
Vertical Back		4183/836.6	0.220	1.135	0.250	--
Vertical Front		4183/836.6	0.063	1.135	0.072	--
Tip Mode		4183/836.6	0.018	1.135	0.020	--

Table 10: SAR Values of WCDMA1700

Temperature: 23.0~23.5°C, humidity: 62~64%.					
Test Position of Body With 5 mm	Channel /Frequency (MHz)	SAR(W/Kg), 1.6 (1g average)			Plot No.
		SAR (W/Kg),1g	Scaled Factor	Scaled SAR(W/Kg),1g	
Horizontal Up	1312/1712.4	0.935	1.038	0.971	--
	1413/1732.6	0.973	1.028	1.000	4
	1513/1752.6	0.959	1.023	0.981	--
	1312/1712.4 Repeated	0.938	1.038	0.974	--
	1413/1732.6 Repeated	0.970	1.028	0.997	--
	1513/1752.6 Repeated	0.955	1.023	0.977	--
Horizontal Down	1312/1712.4	0.927	1.038	0.962	--
	1413/1732.6	0.969	1.028	0.996	--
	1513/1752.6	0.945	1.023	0.967	--
	1312/1712.4 Repeated	0.923	1.038	0.958	--
	1413/1732.6 Repeated	0.965	1.028	0.992	--
	1513/1752.6 Repeated	0.942	1.023	0.964	--
Vertical Back	1312/1712.4	0.857	1.038	0.890	--
	1413/1732.6	0.877	1.028	0.902	--
	1513/1752.6	0.857	1.023	0.877	--
	1312/1712.4 Repeated	0.851	1.038	0.883	--
	1413/1732.6 Repeated	0.872	1.028	0.896	--
	1513/1752.6 Repeated	0.853	1.023	0.873	--
Vertical Front	1413/1732.6	0.639	1.028	0.657	--
Tip Mode	1413/1732.6	0.079	1.028	0.081	--

Table 11: SAR Values of WCDMA1900

Temperature: 23.0~23.5°C, humidity: 62~64%.					
Test Position of Body With 5 mm	Channel /Frequency (MHz)	SAR(W/Kg), 1.6 (1g average)			Plot No.
		SAR (W/Kg),1g	Scaled Factor	Scaled SAR(W/Kg),1g	
Horizontal Up	9400/1880	0.523	1.107	0.579	5
Horizontal Down	9400/1880	0.508	1.107	0.562	--
Vertical Back	9400/1880	0.379	1.107	0.420	--
Vertical Front	9400/1880	0.228	1.107	0.252	--
Tip Mode	9400/1880	0.049	1.107	0.054	--

Table 12: SAR Values of LTE Band 2, 20MHz, QPSK

Temperature: 23.0~23.5°C, humidity: 62~64%.					
Test Position of Body With 5 mm	Channel /Frequency (MHz)	SAR(W/Kg), 1.6 (1g average)			Plot No.
		SAR (W/Kg),1g	Scaled Factor	Scaled SAR(W/Kg),1g	
1RB #0					
Horizontal Up	18900/1880	0.502	1.035	0.520	6
Horizontal Down	18900/1880	0.417	1.035	0.432	--
Vertical Back	18900/1880	0.342	1.035	0.354	--
Vertical Front	18900/1880	0.149	1.035	0.154	--
Tip Mode	18900/1880	0.022	1.035	0.023	--
50%RB #0					
Horizontal Up	18900/1880	0.488	1.023	0.499	--
Horizontal Down	18900/1880	0.402	1.023	0.411	--
Vertical Back	18900/1880	0.331	1.023	0.339	--
Vertical Front	18900/1880	0.140	1.023	0.143	--
Tip Mode	18900/1880	0.018	1.023	0.018	--

Table 13: SAR Values of LTE Band 4, 20MHz, QPSK

Temperature: 23.0~23.5°C, humidity: 62~64%.					
Test Position of Body With 5 mm	Channel /Frequency (MHz)	SAR(W/Kg), 1.6 (1g average)			Plot No.
		SAR (W/Kg), 1g	Scaled Factor	Scaled SAR(W/Kg), 1g	
1RB #0					
Horizontal Up	20175/1732.5	0.509	1.138	0.579	--
Horizontal Down	20175/1732.5	0.488	1.138	0.555	--
Vertical Back	20175/1732.5	0.515	1.138	0.586	7
Vertical Front	20175/1732.5	0.279	1.138	0.318	--
Tip Mode	20175/1732.5	0.073	1.138	0.083	--
50%RB #49					
Horizontal Up	20175/1732.5	0.500	1.067	0.534	--
Horizontal Down	20175/1732.5	0.476	1.067	0.508	--
Vertical Back	20175/1732.5	0.504	1.067	0.538	--
Vertical Front	20175/1732.5	0.268	1.067	0.286	--
Tip Mode	20175/1732.5	0.070	1.067	0.075	--

Table 14: SAR Values of LTE Band 5 , 10MHz, QPSK

Temperature: 23.0~23.5°C, humidity: 62~64%.					
Test Position of Body With 5 mm	Channel /Frequency (MHz)	SAR(W/Kg), 1.6 (1g average)			Plot No.
		SAR (W/Kg), 1g	Scaled Factor	Scaled SAR(W/Kg), 1g	
1RB #0					
Horizontal Up	20525/836.5	0.308	1.081	0.333	8
Horizontal Down	20525/836.5	0.252	1.081	0.272	--
Vertical Back	20525/836.5	0.146	1.081	0.158	--
Vertical Front	20525/836.5	0.046	1.081	0.050	--
Tip Mode	20525/836.5	0.006	1.081	0.006	--
50%RB #0					
Horizontal Up	20525/836.5	0.295	1.099	0.324	--
Horizontal Down	20525/836.5	0.242	1.099	0.266	--
Vertical Back	20525/836.5	0.137	1.099	0.151	--
Vertical Front	20525/836.5	0.043	1.099	0.047	--
Tip Mode	20525/836.5	0.005	1.099	0.005	--

Table 15: SAR Values of LTE Band 7,20MHz, QPSK

Temperature: 23.0~23.5°C, humidity: 62~64%.					
Test Position of Body With 5 mm	Channel /Frequency (MHz)	SAR(W/Kg), 1.6 (1g average)			Plot No.
		SAR (W/Kg), 1g	Scaled Factor	Scaled SAR(W/Kg), 1g	
1RB #0					
Horizontal Up	21100/2535	0.429	1.050	0.450	9
Horizontal Down	21100/2535	0.394	1.050	0.414	--
Vertical Back	21100/2535	0.336	1.050	0.353	--
Vertical Front	21100/2535	0.046	1.050	0.048	--
Tip Mode	21100/2535	0.032	1.050	0.034	--
50%RB #0					
Horizontal Up	21100/2535	0.420	1.050	0.441	--
Horizontal Down	21100/2535	0.388	1.050	0.407	--
Vertical Back	21100/2535	0.327	1.050	0.343	--
Vertical Front	21100/2535	0.044	1.050	0.046	--
Tip Mode	21100/2535	0.030	1.050	0.032	--

Note:

Per KDB Publication 941225 D01v03r01. RMC 12.2kbps was as primary mode SAR, when the primary mode SAR less than 1.2W/kg, secondary SAR (HSPA) was not requires.

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 v06)

- ≤ 0.8 W/kg, when the transmission band is ≤ 100 MHz
- ≤ 0.6 W/kg, when the transmission band is between 100 MHz and 200 MHz
- ≤ 0.4 W/kg, when the transmission band is ≥ 200 MHz

11 Measurement Uncertainty

No.	Uncertainty Component	Type	Uncertainty Value (%)	Probability Distribution	k	ci	Standard Uncertainty (%) $u_i(\%)$	Degree of freedom v_{eff} or v_i
Measurement System								
1	—Probe Calibration	B	5.8	N	1	1	5.8	∞
2	—Axial isotropy	B	3.5	R	$\sqrt{3}$	0.5	1.43	∞
3	—Hemispherical Isotropy	B	5.9	R	$\sqrt{3}$	0.5	2.41	∞
4	—Boundary Effect	B	1	R	$\sqrt{3}$	1	0.58	∞
5	—Linearity	B	4.7	R	$\sqrt{3}$	1	2.71	∞
6	—System Detection Limits	B	1.0	R	$\sqrt{3}$	1	0.58	∞
7	Modulation response	B	3	N	1	1	3.00	
8	—Readout Electronics	B	0.5	N	1	1	0.50	∞
9	—Response Time	B	1.4	R	$\sqrt{3}$	1	0.81	∞
10	—Integration Time	B	3.0	R	$\sqrt{3}$	1	1.73	∞
11	—RF Ambient Conditions	B	3.0	R	$\sqrt{3}$	1	1.73	∞
12	—Probe Position Mechanical tolerance	B	1.4	R	$\sqrt{3}$	1	0.81	∞
13	—Probe Position with respect to Phantom Shell	B	1.4	R	$\sqrt{3}$	1	0.81	∞
14	—Extrapolation, Interpolation and Integration Algorithms for Max. SAR evaluation	B	2.3	R	$\sqrt{3}$	1	1.33	∞
Uncertainties of the DUT								
15	—Position of the DUT	A	2.6	N	$\sqrt{3}$	1	2.6	5
16	—Holder of the DUT	A	3	N	$\sqrt{3}$	1	3.0	5

17	–Output Power Variation –SAR drift measurement	B	5.0	R	$\sqrt{3}$	1	2.89	∞
Phantom and Tissue Parameters								
18	– Phantom Uncertainty(shape and thickness tolerances)	B	4	R	$\sqrt{3}$	1	2.31	∞
19	Uncertainty in SAR correction for deviation(in permittivity and conductivity)	B	2	N	1	1	2.00	
20	–Liquid Conductivity Target –tolerance	B	2.5	R	$\sqrt{3}$	0.6	1.95	∞
21	–Liquid Conductivity –measurement Uncertainty)	B	4	N	$\sqrt{3}$	1	0.92	9
22	–Liquid Permittivity Target tolerance	B	2.5	R	$\sqrt{3}$	0.6	1.95	∞
23	–Liquid Permittivity –measurement uncertainty	B	5	N	$\sqrt{3}$	1	1.15	∞
Combined Standard Uncertainty				RSS			10.63	
Expanded uncertainty (Confidence interval of 95 %)				K=2			21.26	

System Check Uncertainty

No.	Uncertainty Component	Type	Uncertainty Value (%)	Probability Distribution	k	ci	Standard Uncertainty (%) $u_i(\%)$	Degree of freedom V_{eff} or v_i
Measurement System								
1	–Probe Calibration	B	5.8	N	1	1	5.8	∞
2	–Axial isotropy	B	3.5	R	$\sqrt{3}$	0.5	1.43	∞
3	–Hemispherical Isotropy	B	5.9	R	$\sqrt{3}$	0.5	2.41	∞
4	–Boundary Effect	B	1	R	$\sqrt{3}$	1	0.58	∞
5	–Linearity	B	4.7	R	$\sqrt{3}$	1	2.71	∞
6	–System Detection Limits	B	1	R	$\sqrt{3}$	1	0.58	∞
7	Modulation response	B	0	N	1	1	0.00	

8	—Readout Electronics	B	0.5	N	1	1	0.50	∞
9	—Response Time	B	0.00	R	$\sqrt{3}$	1	0.00	∞
10	—Integration Time	B	1.4	R	$\sqrt{3}$	1	0.81	∞
11	—RF Ambient Conditions	B	3.0	R	$\sqrt{3}$	1	1.73	∞
12	—Probe Position Mechanical tolerance	B	1.4	R	$\sqrt{3}$	1	0.81	∞
13	—Probe Position with respect to Phantom Shell	B	1.4	R	$\sqrt{3}$	1	0.81	∞
14	—Extrapolation, Interpolation and Integration Algorithms for Max. SAR evaluation	B	2.3	R	$\sqrt{3}$	1	1.33	∞
Uncertainties of the DUT								
15	Deviation of experimental source from numerical source	A	4	N	1	1	4.00	5
16	Input Power and SAR drift measurement	A	5	R	$\sqrt{3}$	1	2.89	5
17	Dipole Axis to Liquid Distance	B	2	R	$\sqrt{3}$	1	1.2	∞
Phantom and Tissue Parameters								
18	—Phantom Uncertainty(shape and thickness tolerances)	B	4	R	$\sqrt{3}$	1	2.31	∞
19	Uncertainty in SAR correction for deviation(in permittivity and conductivity)	B	2	N	1	1	2.00	
20	—Liquid Conductivity Target –tolerance	B	2.5	R	$\sqrt{3}$	0.6	1.95	∞
21	—Liquid Conductivity –measurement Uncertainty)	B	4	N	$\sqrt{3}$	1	0.92	9
22	—Liquid Permittivity Target tolerance	B	2.5	R	$\sqrt{3}$	0.6	1.95	∞
23	—Liquid Permittivity –measurement uncertainty	B	5	N	$\sqrt{3}$	1	1.15	∞
Combined Standard Uncertainty				RSS			10.15	
Expanded uncertainty (Confidence interval of 95 %)				K=2			20.29	

**12 MAIN TEST INSTRUMENTS**

EQUIPMENT	TYPE	Series No.	Calibration Date	calibration period
System Simulator	CMW500	130805	2015/08/10	1 Year
SAR Probe	SATIMO	SN_0413_EP166	2015/08/10	1 Year
Dipole	SID835	SN09/13 DIP0G835-217	2014/08/28	2 Year
Dipole	SID1800	SN09/13 DIP1G800-216	2014/08/28	2 Year
Dipole	SID1900	SN09/13 DIP1G900-218	2014/08/28	2 Year
Dipole	SID2450	SN09/13 DIP2G450-220	2014/08/28	2 Year
Dipole	SID2600	SN32/14 DIP2G600-338	2014/08/12	2 Year
Vector Network Analyzer	ZVB8	A0802530	2016/06/07	1 Year
Signal Generator	SMR27	A0304219	2016/06/07	1 Year
Power Meter	NRP2	A140401673	2016/03/09	1 Year
Power Sensor	NPR-Z11	1138.3004.02-114072-nq	2016/03/09	1 Year
Amplifier	Nucletudes	143060	2016/03/09	1 Year
Directional Coupler	DC6180A	305827	2016/03/09	1 Year
Power Meter	NRVS	A0802531	2016/03/09	1 Year
Power Sensor	NRV-Z4	100069	2016/03/09	1 Year
Multimeter	Keithley-2000	4014020	2016/03/09	1 Year