FCC SAR TEST REPORT

Report No:	ES/2017/A0001
Applicant:	Huawei Technologies Co., Ltd.
Manufacturer:	Huawei Technologies Co., Ltd.
Product Name:	LTE USB Stick
Model No.(EUT):	MS2372h-607
Trade Mark:	HUAWEI
FCC ID:	QISMS2372H-607
Standards:	FCC 47CFR §2.1093
Date of Receipt:	2017-10-05
Date of Test:	2017-10-06 to 2017-10-07
Date of Issue:	2017-10-17
Test conclusion:	**PASS ***

* In the configuration tested, the EUT detailed in this report complied with the standards specified above.

Remarks:

This report details the results of the testing carried out on one sample, the results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

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Signed on behalf of SGS

Sr. Engineer	**Supervisor**
Matt Kuo (signed: Matt Kuo)	**John Yeh** (signed: John Yeh)
Date: Oct. 17, 2017	**Date: Oct. 17, 2017**

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REVISION HISTORY

Revision Record				
Version	**Chapter**	**Date**	**Modifier**	**Remark**
01		2017-10-17		Original

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TEST SUMMARY

Frequency Band	Test position	Test mode	Max Report SAR (W/kg)	SAR limit (W/kg)
GSM850	Body	GPRS 2TS	1.19	1.6
GSM1900	Body	GPRS 2TS	0.66	1.6
LTE Band 7	Body	QPSK	0.93	1.6

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1 General Information

1.1 Details of Client

Applicant:	Huawei Technologies Co., Ltd.
Address:	Administration Buliding Headquarters of Huawei Technologies Co.,Ltd.Bantian,longgang District 518129 Shenzhen PEOPLE'S REPUBLIC OF CHINA
Manufacturer:	Huawei Technologies Co., Ltd.
Address:	Administration Buliding Headquarters of Huawei Technologies Co.,Ltd.Bantian,longgang District 518129 Shenzhen PEOPLE'S REPUBLIC OF CHINA

1.2 Test Location

SGS Taiwan Ltd. Electronics & Communication Laboratory	
No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan	
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Fax	+886-2-2298-0488
Internet	http://www.tw.sgs.com/

1.3 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

• CNAS (No. CNAS L2929)

CNAS has accredited SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC Lab to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.

• A2LA (Certificate No. 3816.01)

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 3816.01.

• VCCI

The 10m Semi-anechoic chamber and Shielded Room of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-823, R-4188, T-1153 and C-2383 respectively.

• FCC –Designation Number: CN1178

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized as an accredited testing laboratory.

Designation Number: CN1178. Test Firm Registration Number: 406779.

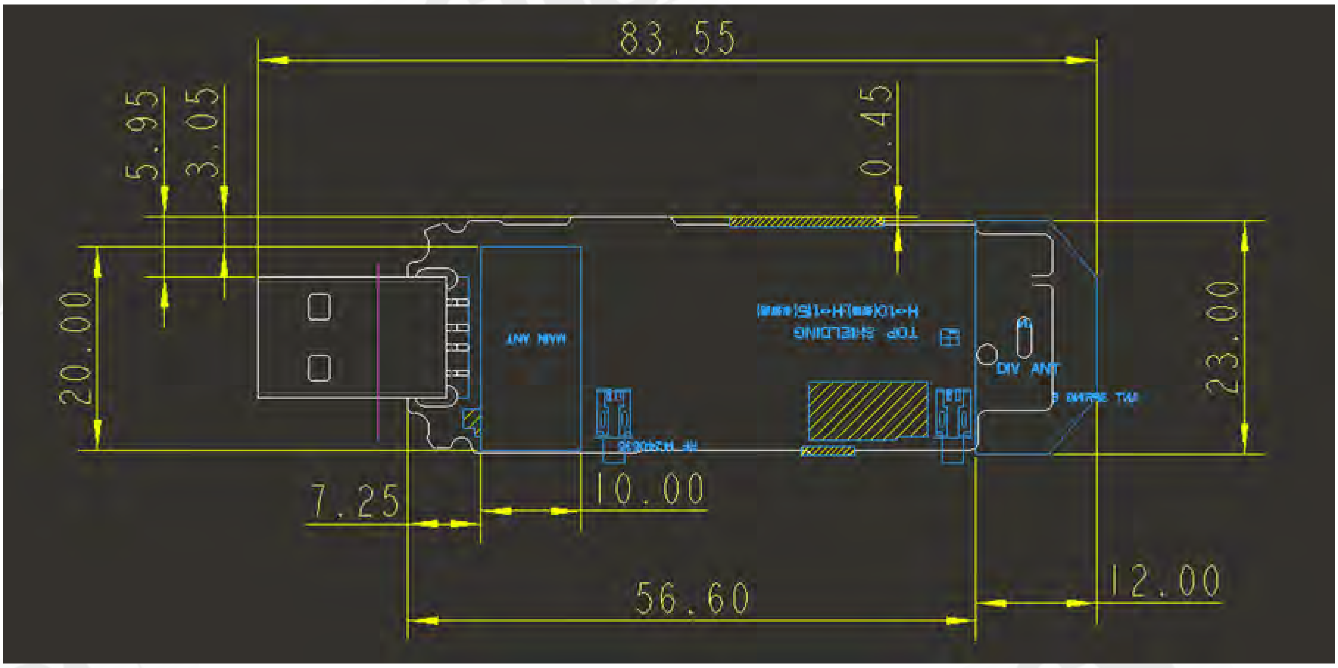
• Industry Canada (IC)

Two 3m Semi-anechoic chambers and the 10m Semi-anechoic chamber of SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC Lab have been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 4620C-1, 4620C-2, 4620C-3.

1.4 General Description of EUT

Product Name:	LTE USB Stick		
Model No.(EUT):	MS2372h-607		
Trade Mark:	HUAWEI		
Product Phase:	production unit		
Device Type :	portable device		
Exposure Category:	uncontrolled environment / general population		
FCC ID:	QISMS2372H-607		
SN:	2NU0117912000078		
Hardware Version:	CL1MS2372HM01 VER.B		
Software Version:	21.328.01.07.00		
Antenna Type:	Inner Antenna		
Device Operating Configurations :			
Modulation Mode:	GSM: GMSK, 8PSK; LTE:QPSK, 16QAM		
GPRS Multi-slots Class:	12	EGPRS Multi-slots Class:	12
LTE Category:	4	LTE Release:	9
Power Class	GSM 850: 4		
	GSM 1900: 1		
Power Level	GSM 850: 5		
	GSM 1900:0		
	LTE Band 7: Max power		
Frequency Bands:	Band	Tx (MHz)	Rx (MHz)
	GSM850	824-849	869-894
	GSM1900	1850-1910	1930-1990
	LTE Band 7	2500-2570	2620- 2690

1.4.1 DUT Antenna Locations



EUT Sides for SAR Testing					
Mode	Front	Back	Left	Right	Tip
GSM	Yes	Yes	Yes	Yes	Yes
LTE	Yes	Yes	Yes	Yes	Yes

Table 1: EUT Sides for SAR Testing

1.5 Test Specification

Identity	Document Title
FCC 47CFR §2.1093	Radiofrequency Radiation Exposure Evaluation: Portable Devices
IEEE Std C95.1 – 1991	IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz – 300 GHz.
IEEE 1528-2013	Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques
KDB 941225 D01 3G SAR Procedures v03r01	3G SAR Measurement Procedures
KDB 941225 D05 SAR for LTE Devices v02r05	SAR EVALUATION CONSIDERATIONS FOR LTE DEVICES
KDB447498 D01 General RF Exposure Guidance v06	Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies
KDB447498 D02 SAR Procedures for Dongle Xmtr v02r01	SAR MEASUREMENT PROCEDURES FOR USB DONGLE TRANSMITTERS
KDB447498 D03 Supplement C Cross-Reference v01	OET Bulletin 65, Supplement C Cross-Reference
KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04	SAR Measurement Requirements for 100 MHz to 6 GHz
KDB 865664 D02 RF Exposure Reporting v01r02	RF Exposure Compliance Reporting and Documentation Considerations

1.6 RF exposure limits

Human Exposure	Uncontrolled Environment General Population	Controlled Environment Occupational
Spatial Peak SAR* (Brain*Trunk)	**1.60 mW/g**	8.00 mW/g
Spatial Average SAR** (Whole Body)	0.08 mW/g	0.40 mW/g
Spatial Peak SAR*** (Hands/Feet/Ankle/Wrist)	4.00 mW/g	20.00 mW/g

Notes:

* The Spatial Peak value of the SAR averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time

** The Spatial Average value of the SAR averaged over the whole body.

*** The Spatial Peak value of the SAR averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.

Uncontrolled Environments are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure.

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.)

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2 Laboratory Environment

Temperature	Min. = 18°C, Max. = 25 °C
Relative humidity	Min. = 30%, Max. = 70%
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.	

Table 2： The Ambient Conditions

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3 SAR Measurements System Configuration

3.1 The SAR Measurement System

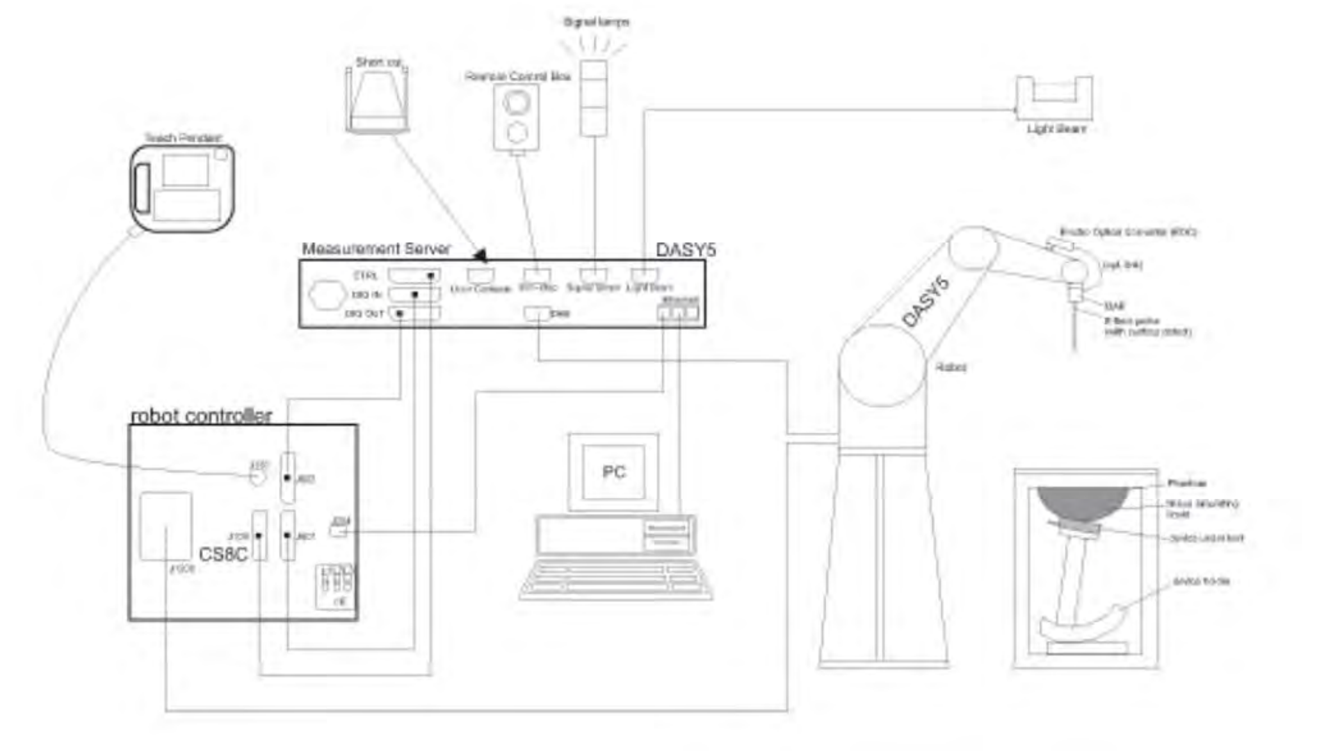
This SAR Measurement System uses a Computer-controlled 3-D stepper motor system (SPEAG DASY5 professional system). A E-field probe is used to determine the internal electric fields. The SAR can be obtained from the equation SAR= σ (|Ei|2)/ ρ where σ and ρ are the conductivity and mass density of the tissue-Simulate.

The DASY5 system for performing compliance tests consists of the following items:
A standard high precision 6-axis robot (Stabile RX family) with controller, teach pendant and software .An arm extension for accommodation the data acquisition electronics (DAE).

A dosimetric probe, i.e., an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with an optical surface detector system.

A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.

The Electro-optical converter (EOC) performs the conversion between optical and electrical of the signals for the digital communication to DAE and for the analog signal from the optical surface detection. The EOC is connected to the measurement server.



F-1. SAR Measurement System Configuration

- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- A probe alignment unit which improves the (absolute) accuracy of the probe positioning.
- A computer operating Windows 7.
- DASY5 software.
- Remote control with teach pendant and additional circuitry for robot safety such as warning lamps, etc.
- The SAM twin phantom enabling testing left-hand, right-hand and Body Worn usage.
- The device holder for handheld mobile phones.
- Tissue simulating liquid mixed according to the given recipes.
- Validation dipole kits allowing to validating the proper functioning of the system.

3.2 Isotropic E-field Probe EX3DV4

	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Calibration	ISO/IEC 17025 calibration service available.
Frequency	10 MHz to > 6 GHz Linearity: ± 0.2 dB (30 MHz to 6 GHz)
Directivity	± 0.3 dB in TSL (rotation around probe axis) ± 0.5 dB in TSL (rotation normal to probe axis)
Dynamic Range	10 µW/g to > 100 mW/g Linearity: ± 0.2 dB (noise: typically < 1 µW/g)
Dimensions	Overall length: 337 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm
Application	High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields); the only probe that enables compliance testing for frequencies up to 6 GHz with precision of better 30%.
Compatibility	DASY3, DASY4, DASY52 SAR and higher, EASY4/MRI

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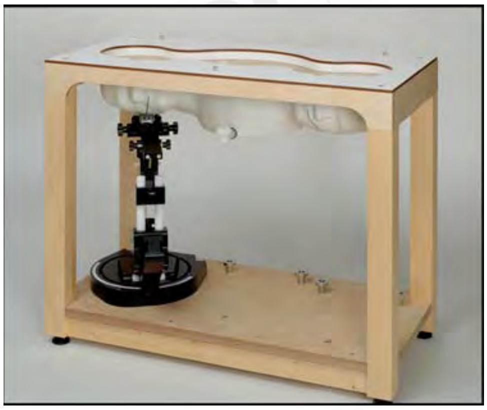
3.3 Data Acquisition Electronics (DAE)

Model	DAE4	
Construction	Signal amplifier, multiplexer, A/D converter and control logic. Serial optical link for communication with DASY4/5 embedded system (fully remote controlled). Two step probe touch detector for mechanical surface detection and emergency robot stop.	
Measurement Range	-100 to +300 mV (16 bit resolution and two range settings: 4mV,400mV)	
Input Offset Voltage	< 5μV (with auto zero)	
Input Bias Current	< 50 f A	
Dimensions	60 x 60 x 68 mm	

3.4 SAM Twin Phantom

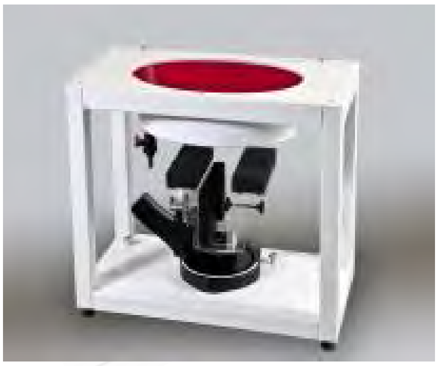
Material	Vinylester, glass fiber reinforced (VE-GF)	
Liquid Compatibility	Compatible with all SPEAG tissue simulating liquids (incl. DGBE type)	
Shell Thickness	2 ± 0.2 mm (6 ± 0.2 mm at ear point)	
Dimensions (incl. Wooden Support)	Length: 1000 mm Width: 500 mm Height: adjustable feet	
Filling Volume	approx. 25 liters	
Wooden Support	SPEAG standard phantom table	

The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528 and IEC 62209-1. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents evaporation of the liquid. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by teaching three points with the robot.

Twin SAM V5.0 has the same shell geometry and is manufactured from the same material as Twin SAM V4.0, but has reinforced top structure.

3.5 ELI Phantom

Material	Vinylester, glass fiber reinforced (VE-GF)
Liquid Compatibility	Compatible with all SPEAG tissue simulating liquids (incl. DGBE type)
Shell Thickness	2.0 ± 0.2 mm (bottom plate)
Dimensions	Major axis: 600 mm Minor axis: 400 mm
Filling Volume	approx. 30 liters
Wooden Support	SPEAG standard phantom table



Phantom for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI is fully compatible with the IEC 62209-2 standard and all known tissue simulating liquids. ELI has been optimized regarding its performance and can be integrated into our standard phantom tables. A cover prevents evaporation of the liquid. Reference markings on the phantom allow installation of the complete setup, including all predefined phantom positions and measurement grids, by teaching three points. The phantom is compatible with all SPEAG dosimetric probes and dipoles.

ELI V5.0 has the same shell geometry and is manufactured from the same material as ELI4, but has reinforced top structure.

3.6 Device Holder for Transmitters

F-2. **Device Holder for Transmitters**

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

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3.7 Measurement procedure

3.7.1 Scanning procedure

Step 1: Power reference measurement

The “reference” and “drift” measurements are located at the beginning and end of the batch process. They measure the field drift at one single point in the liquid over the complete procedure.

Step 2: *Area scan*

The SAR distribution at the exposed side of the head was measured at a distance of 4mm from the inner surface of the shell. The area covered the entire dimension of the head and the horizontal grid spacing was 15mm*15mm or 12mm*12mm or 10mm*10mm.Based on the area scan data, the area of the maximum absorption was determined by spline interpolation.

Step 3: *Zoom scan*

Around this point, a volume of 32mm*32mm*30mm (f≤2GHz), 30mm*30mm*30mm (f for 2-3GHz) and 24mm*24mm*22mm (f for 5-6GHz) was assessed by measuring 5x5x7 points (f≤2GHz), 7x7x7 points (f for 2-3GHz) and 7x7x12 points (f for 5-6GHz). On this basis of this data set, the spatial peak SAR value was evaluated with the following procedure:

The data at the surface was extrapolated, since the centre of the dipoles is 2.0mm away from the tip of the probe and the distance between the surface and the lowest measuring point is 1.2mm. (This can be variable. Refer to the probe specification).The extrapolation was based on a least square algorithm. A polynomial of the fourth order was calculated through the points in z-axes. This polynomial was then used to evaluate the points between the surface and the probe tip. The maximum interpolated value was searched with a straight-forward algorithm. Around this maximum the SAR values averaged over the spatial volumes (1g or 10g) were computed using the 3D-Spline interpolation algorithm. The volume was integrated with the trapezoidal algorithm. One thousand points were interpolated to calculate the average. All neighbouring volumes were evaluated until no neighboring volume with a higher average value was found.

The area and zoom scan resolutions specified in the table below must be applied to the SAR measurements Probe boundary effect error compensation is required for measurements with the probe tip closer than half a probe tip diameter to the phantom surface. Both the probe tip diameter and sensor offset distance must satisfy measurement protocols; to ensure probe boundary effect errors are minimized and the higher fields closest to the phantom surface can be correctly measured and extrapolated to the phantom surface for computing 1-g SAR. Tolerances of the post-processing algorithms must be verified by the test laboratory for the scan resolutions used in the SAR measurements, according to the reference distribution functions specified in IEEE Std. 1528-2013.

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			≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface			5 ± 1 mm	½·δ·ln(2) ± 0.5 mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location			30° ± 1°	20° ± 1°
Maximum area scan spatial resolution: Δx_{Area}, Δy_{Area}			≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3 – 4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 10 mm
			When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	
Maximum zoom scan spatial resolution: Δx_{Zoom}, Δy_{Zoom}			≤ 2 GHz: ≤ 8 mm 2 – 3 GHz: ≤ 5 mm*	3 – 4 GHz: ≤ 5 mm* 4 – 6 GHz: ≤ 4 mm*
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{Zoom}(n)$		≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm
	graded grid	$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface	≤ 4 mm	3 – 4 GHz: ≤ 3 mm 4 – 5 GHz: ≤ 2.5 mm 5 – 6 GHz: ≤ 2 mm
		$\Delta z_{Zoom}(n>1)$: between subsequent points	≤ 1.5·$\Delta z_{Zoom}(n-1)$	
Minimum zoom scan volume	x, y, z		≥ 30 mm	3 – 4 GHz: ≥ 28 mm 4 – 5 GHz: ≥ 25 mm 5 – 6 GHz: ≥ 22 mm

Step 4: Power reference measurement (drift)

The Power Drift Measurement job measures the field at the same location as the most recent power reference measurement job within the same procedure, and with the same settings. The indicated drift is mainly the variation of the DUT's output power and should vary max. ± 5 %

3.7.2 Data Storage

The DASY software stores the acquired data from the data acquisition electronics as raw data (in microvolt readings from the probe sensors), together with all necessary software parameters for the data evaluation (probe calibration data, liquid parameters and device frequency and modulation data) in measurement files with the extension ".DAE4". The software evaluates the desired unit and format for output each time the data is visualized or exported. This allows verification of the complete software setup even after the measurement and allows correction of incorrect parameter settings. For example, if a measurement has been performed with a wrong crest factor parameter in the device setup, the parameter can be corrected afterwards and the data can be re-evaluated. The measured data can be visualized or exported in different units or formats, depending on the selected probe type ([V/m], [A/m], [°C], [m W/g], [m W/cm²], [dBrel], etc.). Some of these units are not available in certain situations or show meaningless results, e.g., a SAR output in a lossless media will always be zero. Raw data can also be exported to perform the evaluation with other software packages.

3.7.3 Data Evaluation by SEMCAD

The SEMCAD software automatically executes the following procedures to calculate the field units from the microvolt readings at the probe connector. The parameters used in the evaluation are stored in the configuration modules of the software:

Probe parameters: - Sensitivity Normi, ai0, ai1, ai2
- Conversion factor ConvFi
- Diode compression point Dcpi
Device parameters: - Frequency f
- Crest factor cf
Media parameters: - Conductivity ε
- Density ρ

These parameters must be set correctly in the software. They can be found in the component documents or they can be imported into the software from the configuration files issued for the DASY components. In the direct measuring mode of the multimeter option, the parameters of the actual system setup are used. In the scan visualization and export modes, the parameters stored in the corresponding document files are used.

The first step of the evaluation is a linearization of the filtered input signal to account for the compression characteristics of the detector diode. The compensation depends on the input signal, the diode type and the DC-transmission factor from the diode to the evaluation electronics.

If the exciting field is pulsed, the crest factor of the signal must be known to correctly compensate for peak power.

The formula for each channel can be given as:

$$V_i = U_i + U_i^2 \cdot cf / dcp_i$$

With Vi = compensated signal of channel i (i = x, y, z)

Ui = input signal of channel i (i = x, y, z)

cf = crest factor of exciting field (DASY parameter)

dcp i = diode compression point (DASY parameter)

From the compensated input signals the primary field data for each channel can be evaluated:

E-field probes:

$$E_i = (V_i / Norm_i \cdot ConvF)^{1/2}$$

H-field probes:

$$H_i = (V_i)^{1/2} \cdot (a_{i0} + a_{i1} f + a_{i2} f^2) / f$$

With Vi = compensated signal of channel i (i = x, y, z)
Normi = sensor sensitivity of channel I (i = x, y, z)
[mV/(V/m)2] for E-field Probes
ConvF = sensitivity enhancement in solution
aij = sensor sensitivity factors for H-field probes
f = carrier frequency [GHz]
Ei = electric field strength of channel i in V/m

Hi = magnetic field strength of channel i in A/m

The RSS value of the field components gives the total field strength (Hermitian magnitude):

$$E_{tot} = (E_x^2 + E_Y^2 + E_z^2)^{1/2}$$

The primary field data are used to calculate the derived field units.

$$SAR = (Etot^2 \cdot \sigma) / (\varepsilon \cdot 1000)$$

with SAR = local specific absorption rate in mW/g

Etot = total field strength in V/m

σ= conductivity in [mho/m] or [Siemens/m]

ε= equivalent tissue density in g/cm3

Note that the density is normally set to 1 (or 1.06), to account for actual brain density rather than the density of the simulation liquid. The power flow density is calculated assuming the excitation field to be a free space field.

$$P_{pwe} = E_{tot}^2 / 3770 \quad \text{or} \quad P_{pwe} = H_{tot}^2 \cdot 37.7$$

with Ppwe = equivalent power density of a plane wave in mW/cm2
Etot = total electric field strength in V/m

Htot = total magnetic field strength in A/m

4 SAR measurement variability and uncertainty

4.1 SAR measurement variability

Per KDB865664 D01 SAR measurement 100 MHz to 6 GHz v01r04, SAR measurement variability must be assessed for each frequency band, which is determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. The 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.
The same procedures should be adapted for measurements according to extremity and occupational exposure limits by applying a factor of 2.5 for extremity exposure and a factor of 5 for occupational exposure to the corresponding SAR thresholds.

4.2 SAR measurement uncertainty

Per KDB865664 D01 SAR Measurement 100 MHz to 6 GHz,when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg, the extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2013 is not required in SAR reports submitted for equipment approval. The equivalent ratio (1.5/1.6) is applied to extremity and occupational exposure conditions.

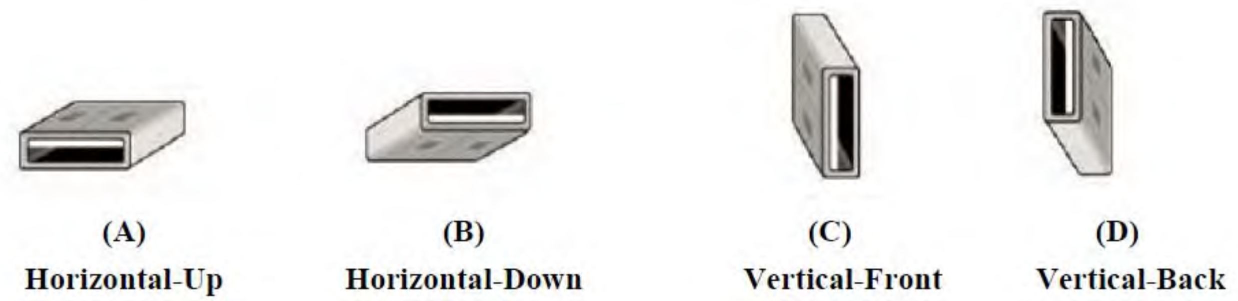
5 Description of Test Position

5.1 Body Exposure Condition

5.1.1 USB Dongle Transmitters exposure conditions

1) Simple Dongle Procedures

Test all USB orientations [see figure below: (A) Horizontal-Up, (B) Horizontal-Down, (C) Vertical-Front, and (D) Vertical-Back] with a device-to-phantom separation distance of 5 mm or less, according to KDB Publication 447498 D01 requirements. These test orientations are intended for the exposure conditions found in typical laptop/notebook/netbook or tablet computers with either horizontal or vertical USB connector configurations at various locations in the keyboard section of the computer. Current generation portable host computers should be used to establish the required SAR measurement separation distance. The same test separation distance must be used to test all frequency bands and modes in each USB orientation. For all test in this report, the device connection was implemented on a laptop computer with model No. ThinkPad 11e 3rd Gen, which made by Lenovo (Beijing) Co., Ltd.



F-3. **USB Connector Orientations Implemented on Laptop Computers**

6 SAR System Verification Procedure

6.1 Tissue Simulate Liquid

6.1.1 Recipes for Tissue Simulate Liquid

The bellowing tables give the recipes for tissue simulating liquids to be used in different frequency bands:

Ingredients (% by weight)	Frequency (MHz)							
	450		835		1800-2000		2300-2700	
Tissue Type	**Head**	**Body**	**Head**	**Body**	**Head**	**Body**	**Head**	**Body**
Water	38.56	51.16	40.30	50.75	55.24	70.17	55.00	68.53
Salt (NaCl)	3.95	1.49	1.38	0.94	0.31	0.39	0.2	0.1
Sucrose	56.32	46.78	57.90	48.21	0	0	0	0
HEC	0.98	0.52	0.24	0	0	0	0	0
Bactericide	0.19	0.05	0.18	0.10	0	0	0	0
Tween	0	0	0	0	44.45	29.44	44.80	31.37
Salt: 99^{+}% Pure Sodium Chloride Water: De-ionized, 16 $M\Omega^{+}$ resistivity Tween: Polyoxyethylene (20) sorbitan monolaurate					Sucrose: 98^{+}% Pure Sucrose HEC: Hydroxyethyl Cellulose			

Table 3： Recipe of Tissue Simulate Liquid

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6.1.2 Measurement for Tissue Simulate Liquid

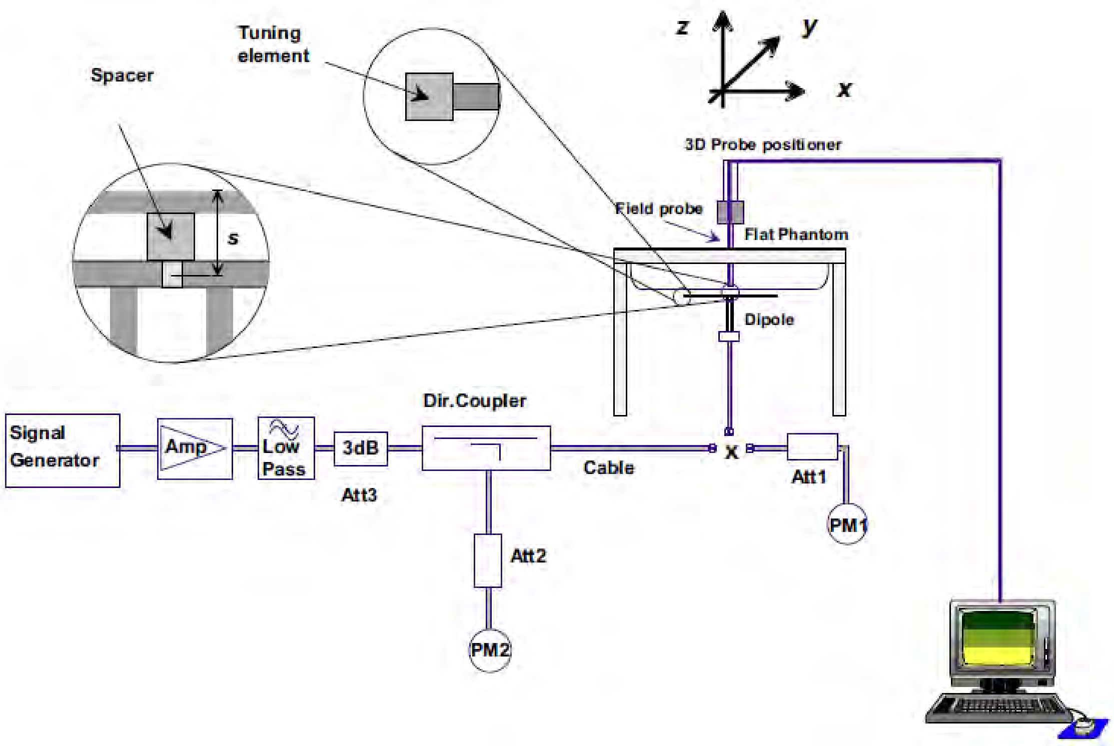
The dielectric properties for this Tissue Simulate Liquids were measured by using the Agilent Model 85070E Dielectric Probe in conjunction with Agilent E5071C Network Analyzer (300 KHz-8500 MHz). The Conductivity (σ) and Permittivity (ρ) are listed in Table 4. For the SAR measurement given in this report. The temperature variation of the Tissue Simulate Liquids was 22±2°C.

Tissue Type	Measured Frequency （MHz）	Target Tissue (±5%)		Measured Tissue		Liquid Temp.	Measured Date
		ε_r	σ(S/m)	ε_r	σ(S/m)	(℃)	
835 Body	835	55.2 (52.44~57.96)	0.97 (0.92~1.02)	53.853	0.986	22.1	2017/10/6
1900 Body	1900	53.3 (50.64~55.97)	1.52 (1.44~1.60)	51.834	1.502	22.3	2017/10/6
2600 Body	2600	52.50 (49.88~55.13)	2.16 (2.05~2.27)	53.353	2.163	22.1	2017/10/7

Table 4： Measurement result of Tissue electric parameters

6.2 SAR System Check

The microwave circuit arrangement for system check is sketched in bellow figure. The daily system accuracy verification occurs within the flat section of the SAM phantom. A SAR measurement was performed to see if the measured SAR was within +/- 10% from the target SAR values. The tests were conducted on the same days as the measurement of the EUT. The obtained results from the system accuracy verification are displayed in the following table. During the tests, the ambient temperature of the laboratory was in the range 22±2°C, the relative humidity was in the range 60% and the liquid depth above the ear reference points was above 15 cm in all the cases. It is seen that the system is operating within its specification, as the results are within acceptable tolerance of the reference values.



F-4. the microwave circuit arrangement used for SAR system check

6.2.1 Justification for Extended SAR Dipole Calibrations

1) Referring to KDB865664 D01 requirements for dipole calibration, instead of the typical annual calibration recommended by measurement standards, longer calibration intervals of up to three years may be considered when it is demonstrated that the SAR target, impedance and return loss of a dipole have remain stable according to the following requirements. Each measured dipole is expected to evaluate with the following criteria at least on annual interval in Appendix C.

a) There is no physical damage on the dipole;
b) System check with specific dipole is within 10% of calibrated value;
c) Return-loss is within 10% of calibrated measurement;
d) Impedance is within 5Ω from the previous measurement.

2) Network analyzer probe calibration against air, distilled water and a shorting block performed before measuring liquid parameters.

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6.2.2 Summary System Check Result(s)

Validation Kit		Measured SAR 250mW	Measured SAR 250mW	Measured SAR (normalized to 1w)	Measured SAR (normalized to 1w)	Target SAR (normalized to 1w) (±10%)	Target SAR (normalized to 1w) (±10%)	Liquid Temp. (℃)	Measured Date
		1g (W/kg)	10g (W/kg)	1g (W/kg)	10g (W/kg)	1-g(W/kg)	10-g(W/kg)		
D835V2	Body	2.48	1.63	9.92	6.52	9.65 (8.69~10.62)	6.46 (5.81~7.11)	22.1	2017/10/6
D1900V2	Body	10.2	5.4	40.8	21.6	41.6 (37.44~45.76)	21.4 (19.26~23.54)	22.3	2017/10/6
D2600V2	Body	13.3	6.03	53.2	24.12	54.2 (48.78~59.62)	24.3 (21.87~26.73)	22.1	2017/10/7

Table 5： SAR System Check Result

6.2.3 Detailed System Check Results

Please see the Appendix A

7 Test Configuration

7.1 3G SAR Test Reduction Procedure

According to KDB 941225D01, in the following procedures, the mode tested for SAR is referred to as the primary mode. The equivalent modes considered for SAR test reduction are denoted as secondary modes. Both primary and secondary modes must be in the same frequency band. When the maximum output power and tune-up tolerance specified for production units in a secondary mode is ≤ ¼ 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. This is referred to as the 3G SAR test reduction procedure in the following SAR test guidance, where the primary mode is identified in the applicable wireless mode test procedures and the secondary mode is wireless mode being considered for SAR test reduction by that procedure. When the 3G SAR test reduction procedure is not satisfied, it is identified as “otherwise” in the applicable procedures; SAR measurement is required for the secondary mode.

7.2 Operation Configurations

7.2.1 GSM Test Configuration

SAR tests for GSM 850 and GSM 1900, a communication link is set up with a base station by air link. Using CMU200 the power lever is set to “5”and “0” in SAR of GSM 850 and GSM 1900. The tests in the band of GSM 850 and GSM 1900 are performed in the mode of GPRS/EGPRS function. Since the GPRS class is 12 for this EUT, it has at most 4 timeslots in uplink and at most 4 timeslots in downlink, the maximum total timeslot is 5. The EGPRS class is 12 for this EUT, it has at most 4 timeslots in uplink, and at most 4 timeslots in downlink, the maximum total timeslot is 5.

SAR test reduction for GPRS and EDGE modes is determined by the source-based time-averaged output power specified for production units, including tune-up tolerance. The data mode with highest specified time-averaged output power should be tested for SAR compliance in the applicable exposure conditions. For modes with the same specified maximum output power and tolerance, the higher number time-slot configuration should be tested.

When SAR tests for EGPRS mode is necessary, GMSK modulation should be used to minimize SAR measurement error due to higher peak-to-average power (PAR) ratios inherent in 8-PSK.

The 3G SAR test reduction procedure is applied to 8-PSK EDGE with GMSK GPRS/EDGE as the primary mode

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7.2.2 LTE Test Configuration

LTE modes were tested according to FCC KDB 941225 D05 publication. Please see notes after the tabulated SAR data for required test configurations. Establishing connections with base station simulators ensure a consistent means for testing SAR and are recommended for evaluating SAR [4]. The R&S CMW500 was used for LTE output power measurements and SAR testing. Max power control was used so the UE transmits with maximum output power during SAR testing. SAR must be measured with the maximum TTI (transmit time interval) supported by the device in each LTE configuration.

A) Spectrum Plots for RB Configurations
A properly configured base station simulator was used for SAR tests and power measurements. Therefore, spectrum plots for RB configurations were not required to be included in this report.

B) MPR
MPR is permanently implemented for this device by the manufacturer. The specific manufacturer target MPR is indicated alongside the SAR results. MPR is enabled for this device, according to 3GPP TS36.101 Section 6.2.3 – 6.2.5 under Table 6.2.3-1.

C) A-MPR
A-MPR (Additional MPR) has been disabled for all SAR tests by setting NS=01 on the base station simulator.

D) Largest channel bandwidth standalone SAR test requirements
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. 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.

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

E) 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 A) to determine the channels and RB configurations that need SAR testing and only measure SAR when the highest maximum output power of a configuration requiring testing in the smaller channel bandwidth is > ½ dB higher than the equivalent channel configurations in the largest channel bandwidth configuration or the reported SAR of a configuration for the largest channel bandwidth is > 1.45 W/kg.

8 Test Result

8.1 Measurement of RF conducted Power

8.1.1 Conducted Power Of GSM

GSM 850										
Burst Output Power(dBm)					Tune up	Division Factors	Frame-Average Output Power(dBm)			Tune up
Channel		128	190	251			128	190	251	
GPRS/EGPRS (GMSK)	1 TX Slot	31.87	32.06	32.02	33	-9.19	22.68	22.87	22.83	23.81
	2 TX Slots	29.61	29.86	29.76	31	-6.18	23.43	23.68	23.58	**24.82**
	3 TX Slots	27.55	27.74	27.63	29	-4.42	23.13	23.32	23.21	24.58
	4 TX Slots	25.55	25.88	25.7	27	-3.17	22.38	22.71	22.53	23.83
EGPRS(8PSK)	1 TX Slot	25.61	25.75	25.73	27.5	-9.19	16.42	16.56	16.54	18.31
	2 TX Slots	23.58	23.78	23.71	25.5	-6.18	17.4	17.6	17.53	19.32
	3 TX Slots	21.54	21.62	21.56	23.5	-4.42	17.12	17.2	17.14	19.08
	4 TX Slots	19.26	19.47	19.35	21.5	-3.17	16.09	16.3	16.18	18.33
GSM 1900										
Burst Output Power(dBm)					Tune up	Division Factors	Frame-Average Output Power(dBm)			Tune up
Channel		512	661	810			512	661	810	
GPRS/EGPRS (GMSK)	1 TX Slot	29.17	28.86	28.72	30	-9.19	19.98	19.67	19.53	20.81
	2 TX Slots	27.01	26.71	26.57	28	-6.18	20.83	20.53	20.39	**21.82**
	3 TX Slots	24.82	24.54	24.61	26	-4.42	20.4	20.12	20.19	21.58
	4 TX Slots	22.87	22.77	22.52	24	-3.17	19.7	19.6	19.35	20.83
EGPRS(8PSK)	1 TX Slot	25.35	25.12	24.98	26.5	-9.19	16.16	15.93	15.79	17.31
	2 TX Slots	23.17	22.99	22.91	24.5	-6.18	16.99	16.81	16.73	18.32
	3 TX Slots	21.13	20.91	20.81	22.5	-4.42	16.71	16.49	16.39	18.08
	4 TX Slots	19.02	18.73	18.77	20.5	-3.17	15.85	15.56	15.6	17.33

Table 6： Conducted Power Of GSM

Note:

1）. CMU200 measures GSM peak and average output power for active timeslots. For SAR the time based average power is relevant. The difference in between depends on the duty cycle of the TDMA signal:

No. of timeslots	1	2	3	4
Duty Cycle	1:8.3	1:4.15	1:2.77	1:2.075
Time based avg. power compared to slotted avg. power	-9.19	-6.18	-4.42	-3.17

2）. The frame-averaged power is linearly proportion to the slot number configured and it is linearly scaled the maximum burst-averaged power based on time slots. The calculated method is shown as below:
Frame-averaged power = 10 x log (Burst-averaged power mW x Slot used / 8

3）. 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

8.1.2 Conducted Power Of LTE

LTE Band 7				Conducted Power(dBm)			
Bandwidth	Modulation	RB size	RB offset	Channel 20775	Channel 21100	Channel 21425	Tune up
5MHz	QPSK	1	0	22.13	22.52	22.51	23.5
		1	13	22.46	22.39	22.13	23.5
		1	24	22.28	22.32	22.34	23.5
		12	0	21.26	21.13	20.84	22.5
		12	6	21.41	21.27	21.42	22.5
		12	13	21.09	20.99	21.31	22.5
		25	0	21.11	21.05	21.37	22.5
	16QAM	1	0	21.12	20.83	21.07	22.5
		1	13	21.54	21.54	21.71	22.5
		1	24	20.72	20.67	20.96	22.5
		12	0	20.02	20	20.22	21.5
		12	6	20.22	20.16	20.39	21.5
		12	13	20.04	19.99	20.27	21.5
		25	0	20.06	20.04	20.35	21.5
Bandwidth	Modulation	RB size	RB offset	Channel 20800	Channel 21100	Channel 21400	Tune up
10MHz	QPSK	1	0	22.14	22.02	22.34	23.5
		1	25	22.54	22.48	22.48	23.5
		1	49	22.26	22.29	22.39	23.5
		25	0	20.94	20.95	21.32	22.5
		25	13	21.44	21.22	21.42	22.5
		25	25	21.15	20.85	21.17	22.5
		50	0	20.99	21	21.46	22.5
	16QAM	1	0	21.28	21.13	21.61	22.5
		1	25	21.97	21.71	21.88	22.5
		1	49	20.94	20.63	20.82	22.5
		25	0	20	19.86	20.24	21.5
		25	13	20.3	20.14	20.32	21.5
		25	25	20.04	19.82	20.16	21.5
		50	0	19.87	19.96	20.45	21.5

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Bandwidth	Modulation	RB size	RB offset	Channel 20825	Channel 21100	Channel 21375	Tune up
15MHz	QPSK	1	0	22.55	22.71	22.7	23.5
		1	38	22.51	22.58	22.76	23.5
		1	74	21.86	21.73	21.62	23.5
		36	0	21.2	21.38	21.7	22.5
		36	18	21.28	21.42	21.75	22.5
		36	39	21.46	21.16	21.34	22.5
		75	0	21.36	21.32	21.91	22.5
	16QAM	1	0	21.73	21.79	22.04	22.5
		1	38	21.92	21.88	22.17	22.5
		1	74	21.29	21.03	21.1	22.5
		36	0	20.29	20.38	20.86	21.5
		36	18	20.37	20.33	20.88	21.5
		36	39	20.35	20.09	20.49	21.5
		75	0	20.24	20.26	20.84	21.5
Bandwidth	Modulation	RB size	RB offset	Channel 20850	Channel 21100	Channel 21350	Tune up
20MHz	QPSK	1	0	22.69	22.89	22.92	23.5
		1	50	22.46	22.54	22.69	23.5
		1	99	22.58	22.47	22.48	23.5
		50	0	21.47	21.67	21.77	22.5
		50	25	21.59	21.68	21.9	22.5
		50	50	21.58	21.43	21.54	22.5
		100	0	21.62	21.48	21.79	22.5
	16QAM	1	0	21.83	21.95	21.92	22.5
		1	50	21.89	21.73	22.21	22.5
		1	99	22.11	21.72	21.5	22.5
		50	0	20.34	20.61	20.93	21.5
		50	25	20.49	20.41	21.05	21.5
		50	50	20.74	20.26	20.72	21.5
		100	0	20.54	20.45	20.97	21.5

Table 7： Conducted Power Of LTE

8.2 Measurement of SAR Data

8.2.1 SAR Result Of GSM850

Test position	Test mode	Test Ch./Freq.	Duty Cycle	SAR (W/kg)1-g	Power Drift(dB)	Conducted Power(dBm)	Tune up Limit(dBm)	Scaled factor	Scaled SAR(W/kg)	Liquid Temp
Hotspot Test data(Separate 5mm)										
Front side	GPRS 2TS	190/836.6	1:4.15	0.694	0.03	29.86	31	1.300	0.902	22.1
Back side	GPRS 2TS	190/836.6	1:4.15	0.868	-0.12	29.86	31	1.300	1.129	22.1
Left side	GPRS 2TS	190/836.6	1:4.15	0.132	-0.19	29.86	31	1.300	0.172	22.1
Right side	GPRS 2TS	190/836.6	1:4.15	0.158	-0.03	29.86	31	1.300	0.205	22.1
Top side	GPRS 2TS	190/836.6	1:4.15	0.000512	-0.09	29.86	31	1.300	0.001	22.1
Front side	GPRS 2TS	128/824.2	1:4.15	0.596	0.05	29.61	31	1.377	0.821	22.1
Front side	GPRS 2TS	251/848.8	1:4.15	0.734	0.05	29.76	31	1.330	0.977	22.1
Back side	GPRS 2TS	128/824.2	1:4.15	0.749	-0.13	29.61	31	1.377	1.032	22.1
Back side	GPRS 2TS	251/848.8	1:4.15	0.894	-0.14	29.76	31	1.330	**1.189**	22.1
Back side-repeat	GPRS 2TS	251/848.8	1:4.15	0.889	-0.09	29.76	31	1.330	1.183	22.1

Test Position	Channel/ Frequency (MHz)	Measured SAR (1g)	1st Repeated SAR (1g)	Ratio	2nd Repeated SAR (1g)	3rd Repeated SAR (1g)
Back Side	190/836.6	0.894	0.889	1.005624	N/A	N/A
Note: 1) When the original highest measured SAR is ≥ 0.80 W/kg, the measurement was repeated once.						
2) A second repeated measurement was preformed only if the ratio of largest to smallest SAR for the original and first repeated measurements was > 1.20 or when the original or repeated measurement was ≥ 1.45 W/kg (~ 10% from the 1-g SAR limit).						
3) A third repeated measurement was performed only if the original, first or second repeated measurement was ≥ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.						
4) Repeated measurements are not required when the original highest measured SAR is < 0.80 W/kg						

Table 8: SAR of GSM850 for Body.

Note:

1) The maximum Scaled SAR value is marked in bold. Graph results refer to Appendix B

2) Per FCC KDB Publication 447498 D01, if the reported (scaled) SAR measured at the middle channel or highest output power channel for each test configuration is ≤ 0.8 W/kg then testing at the other channels is not required for such test configuration(s).

8.2.2 SAR Result Of GSM1900

Test position	Test mode	Test Ch./Freq.	Duty Cycle	SAR (W/kg)1-g	Power Drift(dB)	Conducted Power(dBm)	Tune up Limit(dBm)	Scaled factor	Scaled SAR(W/kg)	Liquid Temp
Hotspot Test data(Separate 5mm)										
Front side	GPRS 2TS	661/1880	1:4.15	0.358	-0.09	26.71	28	1.346	0.482	22.3
Back side	GPRS 2TS	661/1880	1:4.15	0.492	-0.14	26.71	28	1.346	**0.662**	22.3
Left side	GPRS 2TS	661/1880	1:4.15	0.163	-0.05	26.71	28	1.346	0.219	22.3
Right side	GPRS 2TS	661/1880	1:4.15	0.463	-0.03	26.71	28	1.346	0.623	22.3
Top side	GPRS 2TS	661/1880	1:4.15	0.0296	-0.08	26.71	28	1.346	0.040	22.3

Table 9： SAR of GSM1900 for Body.

Note:

1) The maximum Scaled SAR value is marked in bold. Graph results refer to Appendix B

2) Per FCC KDB Publication 447498 D01, if the reported (scaled) SAR measured at the middle channel or highest output power channel for each test configuration is ≤ 0.8 W/kg then testing at the other channels is not required for such test configuration(s).

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8.2.3 SAR Result Of LTE 7(20MHz)

Test position	BW.	Test mode	Test Ch./Freq.	Duty Cycle	SAR (W/kg)1-g	Power Drift(dB)	Conducted power(dBm)	Tune up Limit(dBm)	Scaled factor	Scaled SAR(W/kg)	Liquid Temp.
Hotspot Test data(Separate 5mm 1RB_0 offset)											
Front side	20	QPSK	21350/2560	1:1	0.678	-0.07	22.92	23.5	1.143	0.775	22.1
Back side	20	QPSK	21350/2560	1:1	0.787	0.03	22.92	23.5	1.143	0.899	22.1
Left side	20	QPSK	21350/2560	1:1	0.315	-0.03	22.92	23.5	1.143	0.360	22.1
Right side	20	QPSK	21350/2560	1:1	0.8	0	22.92	23.5	1.143	0.914	22.1
Top side	20	QPSK	21350/2560	1:1	0.0313	0.04	22.92	23.5	1.143	0.036	22.1
Back side	20	QPSK	20850/2510	1:1	0.574	-0.05	22.69	23.5	1.205	0.692	22.1
Back side	20	QPSK	21100/2535.5	1:1	0.566	-0.09	22.89	23.5	1.151	0.651	22.1
Right side	20	QPSK	20850/2510	1:1	0.692	-0.14	22.69	23.5	1.205	0.834	22.1
Right side	20	QPSK	21100/2535.5	1:1	0.634	-0.2	22.89	23.5	1.151	0.730	22.1
Right side-repeat	20	QPSK	21350/2560	1:1	0.81	-0.1	22.92	23.5	1.143	**0.926**	22.1
Hotspot Test data (Separate 5mm 50RB_25 offset)											
Front side	20	QPSK	21350/2560	1:1	0.473	0	21.9	22.5	1.148	0.543	22.1
Back side	20	QPSK	21350/2560	1:1	0.472	-0.03	21.9	22.5	1.148	0.542	22.1
Left side	20	QPSK	21350/2560	1:1	0.205	0.08	21.9	22.5	1.148	0.235	22.1
Right side	20	QPSK	21350/2560	1:1	0.522	-0.06	21.9	22.5	1.148	0.599	22.1
Top side	20	QPSK	21350/2560	1:1	0.0204	0.08	21.9	22.5	1.148	0.023	22.1
Hotspot Test data (Separate 5mm 100RB_0 offset)											
Back side	20	QPSK	21350/2560	1:1	0.555	-0.04	21.79	22.5	1.178	0.654	22.1
Right side	20	QPSK	21350/2560	1:1	0.508	-0.08	21.79	22.5	1.178	0.598	22.1

Test Position	Channel/ Frequency (MHz)	Measured SAR (1g)	1st Repeated SAR (1g)	Ratio	2nd Repeated SAR (1g)	3rd Repeated SAR (1g)
Back Side	#N/A	0.8	0.81	1.0125	N/A	N/A
Note: 1) When the original highest measured SAR is ≥ 0.80 W/kg, the measurement was repeated once.						
2) A second repeated measurement was preformed only if the ratio of largest to smallest SAR for the original and first repeated measurements was > 1.20 or when the original or repeated measurement was ≥ 1.45 W/kg (~ 10% from the 1-g SAR limit).						
3) A third repeated measurement was performed only if the original, first or second repeated measurement was ≥ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.						
4) Repeated measurements are not required when the original highest measured SAR is < 0.80 W/kg						

Table 10： SAR of LTE 7 for Body.

Note:

1) The maximum Scaled SAR value is marked in bold. Graph results refer to Appendix B

2) If the reported (scaled) SAR measured at the middle channel or highest output power channel for each test configuration is ≤ 0.8 W/kg then testing at the other channels is not required for such test configuration(s).

8.3 Multiple Transmitter Evaluation

8.3.1 Simultaneous SAR test evaluation

Simultaneous Transmission

NO.	Simultaneous Transmission Configuration	Body
1	GPRS / EDGE(Data)	No
2	LTE(Data)	No

LTE and GPRS/EDGE can't simultaneously transmit.

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9 Equipment list

Test Platform	SPEAG DASY5 Professional
Description	SAR Test System (Frequency range 300MHz-6GHz)
Software Reference	DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Hardware Reference

	Equipment	Manufacturer	Model	Serial Number	Calibration Date	Due date of calibration
☒	Twin Phantom	SPEAG	SAM 1	TP-1283	NCR	NCR
☒	Twin Phantom	SPEAG	SAM 2	1913	NCR	NCR
☒	DAE	SPEAG	DAE4	1267	2017-02-23	2018-02-22
☒	E-Field Probe	SPEAG	EX3DV4	3962	2016-12-19	2017-12-18
☐	Validation Kits	SPEAG	D750V3	1160	2016-06-22	2019-06-21
☒	Validation Kits	SPEAG	D835V2	4d105	2016-12-08	2019-12-07
☐	Validation Kits	SPEAG	D1750V2	1149	2016-06-23	2019-06-22
☒	Validation Kits	SPEAG	D1900V2	5d028	2016-12-07	2019-12-06
☐	Validation Kits	SPEAG	D2450V2	733	2016-12-07	2019-12-06
☒	Validation Kits	SPEAG	D2600V2	1125	2016-06-22	2019-06-21
☒	Agilent Network Analyzer	Agilent	E5071C	MY46523590	2017-03-06	2018-03-05
☒	Dielectric Probe Kit	Agilent	85070E	US01440210	NCR	NCR
☒	Universal Radio Communication Tester	R&S	CMW500	152271	2017-03-06	2018-03-05
☒	RF Bi-Directional Coupler	Agilent	86205-60001	MY31400031	NCR	NCR
☒	Signal Generator	Agilent	N5171B	MY53050736	2017-03-06	2018-03-05
☒	Preamplifier	Mini-Circuits	ZHL-42W	15542	NCR	NCR
☒	Power Meter	Agilent	E4416A	GB41292095	2017-03-06	2018-03-05
☒	Power Sensor	Agilent	8481H	MY41091234	2017-03-05	2018-03-04
☒	Power Sensor	R&S	NRP-Z92	100025	2017-03-06	2018-03-05
☒	Attenuator	SHX	TS2-3dB	30704	NCR	NCR
☒	Coaxial low pass filter	Mini-Circuits	VLF-2500(+)	NA	NCR	NCR
☒	Coaxial low pass filter	Microlab Fxr	LA-F13	NA	NCR	NCR
☒	50 Ω coaxial load	Mini-Circuits	KARN-50+	00850	NCR	NCR
☒	DC POWER SUPPLY	SAKO	SK1730SL5A	NA	NCR	NCR
☒	Speed reading thermometer	MingGao	T809	NA	2017-03-08	2018-03-07
☒	Humidity and Temperature Indicator	KIMTOKA	KIMTOKA	NA	2017-03-08	2018-03-07

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10 Calibration certificate

Please see the Appendix C

11 Photographs

Please see the Appendix D

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Appendix A: Detailed System Validation Results

Appendix B: Detailed Test Results

Appendix C: Calibration certificate

Appendix D: Photographs

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