TEST REPORT

No. I16D00272-SAR

For

Client: Verykool USA Inc

Production: Mobile Phone

Model Name: s5027,s5028

FCC ID: WA6S5027

Hardware Version: R615-MB-V1.0

Software Version: S5027_VK_Generic_Dual_SW_1.0

Issued date: 2017-2-20

Note:

The test results in this test report relate only to the devices specified in this report. This report shall not be reproduced except in full without the written approval of ECIT Shanghai.

Test Laboratory:

ECIT Shanghai, East China Institute of Telecommunications

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Revision Version

Report Number	Revision	Date	Memo
I16D00272-SAR	00	2017-2-20	Initial creation of test report

CONTENTS

1. Test Laboratory

1.1. Testing Location

Company Name:	ECIT Shanghai, East China Institute of Telecommunications
Address:	7-8F, G Area,No. 668, Beijing East Road, Huangpu District, Shanghai, P. R. China
Postal Code:	200001
Telephone:	(+86)-021-63843300
Fax:	(+86)-021-63843301

1.2. Testing Environment

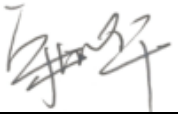
Normal Temperature:	18-25℃
Relative Humidity:	10-70%
Ambient noise & Reflection:	< 0.012 W/kg

1.3. Project Data

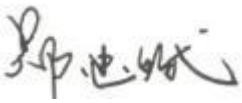
Project Leader:	XuYuting
Testing Start Date:	2017-1-14
Testing End Date:	2017-2-7

1.4. Signature

Yan Hang
(Prepared this test report)



Song Kaihua
(Reviewed this test report)



Zheng Zhongbin
Director of the laboratory
(Approved this test report)

2. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for **s5027,s5028** are as follows (with expanded uncertainty 22.4%)

Table 2.1: Max. Reported SAR Main Supply (1g)

Band	Position/Distance	SAR 10g (W/Kg)
GSM 850	Head	0.437
	Hotspot/10mm	0.691
GSM 1900	Head	0.195
	Hotspot/10mm	0.881
WCDMA Band2	Head	0.227
	Hotspot/10mm	0.781
WCDMA Band5	Head	0.302
	Hotspot/10mm	0.609
Wi-Fi	Head	0.419
	Hotspot/10mm	0.041

Table 2.2: Max. Reported SAR Secondary supply (1g)

Band	Position/Distance	SAR 1g (W/Kg)
GSM 850	Hotspot/10mm	0.494
GSM 1900	Hotspot/10mm	0.800
WCDMA Band2	Hotspot/10mm	0.750
WCDMA Band5	Hotspot/10mm	0.482
Wi-Fi	Head	0.030

Table 2.3: The maximum of SAR values

	Maximum SAR value for Head	**Maximum SAR value for Hotspot**
GSM	0.437	0.881
WCDMA	0.302	0.781
WIFI	0.419	0.041

The SAR values found for the Mobile Phone are below the maximum recommended levels of 1.6 W/Kg as averaged over any 1g tissue according to the ANSI C95.1-1999.

For body worn operation, this device has been tested and meets FCC RF exposure guidelines when used with any accessory that contains no metal. Use of other accessories may not ensure compliance with FCC RF exposure guidelines.

The sample has two antennas. One is main antenna for GSM/WCDMA, and the other is for WiFi/BT. So simultaneous transmission is GSM/WCDMA and WiFi/BT.

Table 2.3: Simultaneous SAR (1g)

Transmission SAR(W/Kg)							
Test Position			2G	3G	WIFI	BT	SUM
Head	Left	Cheek	0.437	0.269	0.419	0.118	0.856
		Tilt 15°	0.270	0.189	0.265	0.118	0.535
	Right	Cheek	0.302	0.302	0.107	0.118	0.420
		Tilt 15°	0.251	0.226	0.096	0.118	0.369
Hotspot 10mm	Phantom Side		0.631	0.500	0.041	0.059	0.690
	Ground Side		0.881	0.609	0.038	0.059	0.940
	Left Side		0.271	0.287	0.008	0.059	0.346
	Right Side		0.347	0.207	0.034	0.059	0.406
	Bottom Side		0.679	0.781	--	0.059	0.840
	Top Side				0.008	0.059	0.059

According to the above table, the maximum sum of reported SAR values for GSM/WCDMA and WiFi is **0.940 W/kg** (1g). The detail for simultaneous transmission consideration is described in chapter 12.

3. Client Information

3.1. Applicant Information

Company Name:	Verykool USA Inc
Address:	3636 Nobel Drive, Suite 325, San Diego, CA92122 USA
Email:	Sunny.choi@infosonics.com
Contact:	Sunny Choi

3.2. Manufacturer Information

Company Name:	Fortune Ship
Address:	6/F, Kanghesheng Building, No.1 Chuangsheng Road, Nanshan District, Shenzhen, Guangdong, China
Email:	lwanhui@fortuneship.com
Contact:	Sky

3.3. Main Supply

Part Name	Model Name	supplier	Remark
Camera	SP5506	Shinetech	5 MP front camera

3.4. Secondary Supply

Part Name	Model Name	supplier	Remark
Camera	GC0409	Shinetech	0.3 MP front camera

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

4.1. About EUT

Description:	Mobile Phone
Model name:	s5027,s5028
Operation Model(s):	GSM850/1900,WCDMA Band II/V WIFI2450
Tx Frequency:	824.2-848.8MHz(GSM850) 1850.2-1909.8MHz（GSM1900） 1852.4-1907.6 MHz (WCDMA Band II) 826.4-846.6MHz (WCDMA Band V) 2412- 2462 MHz (Wi-Fi) 2400-2483.5 MHz (BT)
Test device Production information: GPRS/EGPRS Class Mode: GPRS/ EGPRS Multislot Class:	Production unit B 12
Device type:	Portable device
UE category:	3
Antenna type:	Inner antenna
Accessories/Body-worn configurations:	Headset Battery
Dimensions: Hotspot Mode:	14.5cm×7.3cmx0.8cm Support simultaneous transmission of hotspot and voice (or data)
FCC ID:	WA6S5027

4.2. Internal Identification of EUT used during the test

EUT ID*	SN or IMEI	HW Version	SW Version	Receive Date
N04	352139069743631	R615-MB-V1.0	S5027_VK_Generic_Dual_SW_1.0	2016-12-26
N08	352139069743680	R615-MB-V1.0	S5027_VK_Generic_Dual_SW_1.0	2016-12-26

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

N04 is main supply sample;

N08 is Secondary supply sample;

4.3. Internal Identification of AE used during the test

AE ID*	Description	Model	SN	Manufacturer
A04	Headset	N/A	N/A	N/A
B07	Battery	s5005	S50051604002462	Verykool

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

5. TEST METHODOLOGY

5.1. Applicable Limit Regulations

ANSI C95.1–1999:IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.

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.

5.2. Applicable Measurement Standards

IEEE 1528–2013: Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Body Due to Wireless Communications Devices:
Experimental Techniques.

KDB648474 D04 Handset SAR v01r03:SAR Evaluation Considerations for Wireless Handsets.

KDB248227 D01 802 11 Wi-Fi SAR v02r02: SAR measurement procedures for 802.112abg transmitters.

KDB447498 D01 General RF Exposure Guidance v06: Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies.

KDB865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04:SAR Measurement Requirements for 100 MHz to 6 GHz

KDB865664 D02 RF Exposure Reporting v01r02:provides general reporting requirements as well as certain specific information required to support MPE and SAR compliance.

KDB941225 D01 3G SAR Procedures v03r01: 3G SAR Measurement Procedures.

KDB941225 D05 SAR for LTE Devices v02r04: SAR Evaluation Considerations for LTE Devices.

KDB941225 D06 hotspot SAR v02r01:SAR Evaluation Procedures for Portable Devices with Wireless Router Capabilities.

6. Specific Absorption Rate (SAR)

6.1. Introduction

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

6.2. SAR Definition

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

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

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

$$SAR = c(\frac{\delta T}{\delta t})$$

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

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

Where: σ is the conductivity of the tissue, ρ is the mass density of tissue and E is the RMS electrical field strength.

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

7. Tissue Simulating Liquids

7.1. Targets for tissue simulating liquid

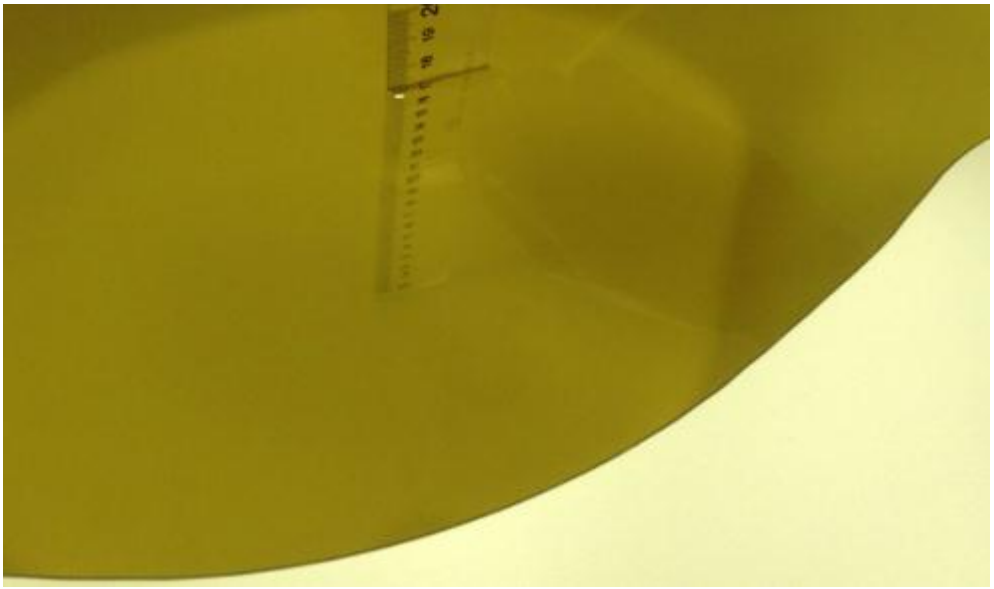
Table 7.1: Targets for tissue simulating liquid

Frequency (MHz)	Liquid Type	Conductivity(σ)	± 5% Range	Permittivity(ε)	± 5% Range
835	Head	0.90	0.86～0.95	41.5	39.4～43.6
835	Body	0.97	0.92～1.02	55.2	52.4～58.0
1900	Head	1.40	1.33～1.47	40.0	38.0～42.0
1900	Body	1.52	1.44～1.60	53.3	50.6～56.0
2450	Head	1.80	1.71～1.89	39.2	37.2～41.2
2450	Body	1.95	1.85～2.05	52.7	50.1～55.3

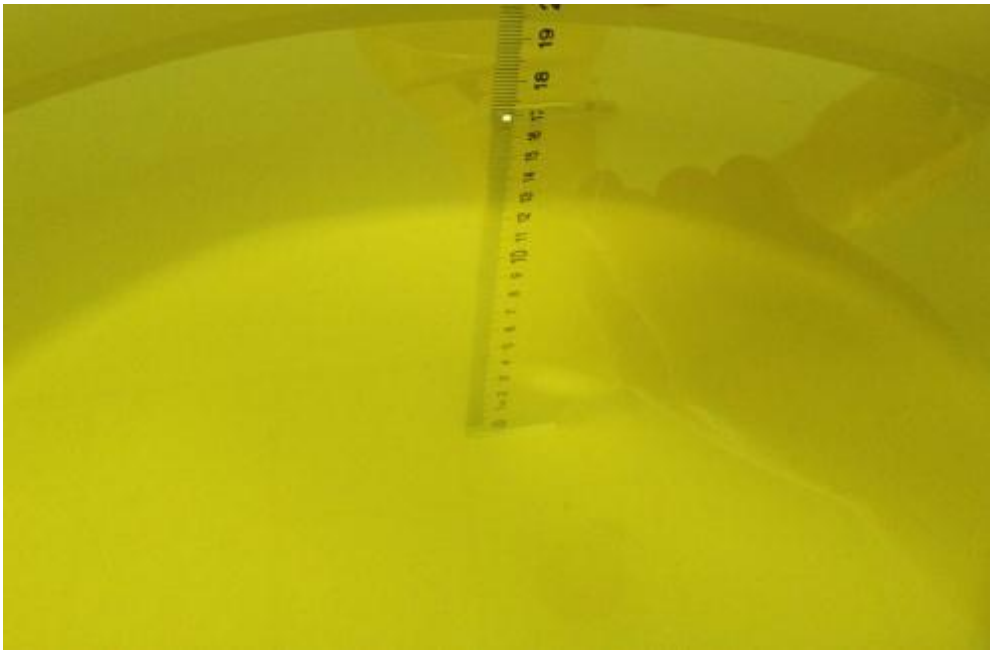
7.2. Dielectric Performance

Table 7.2: Dielectric Performance of Tissue Simulating Liquid

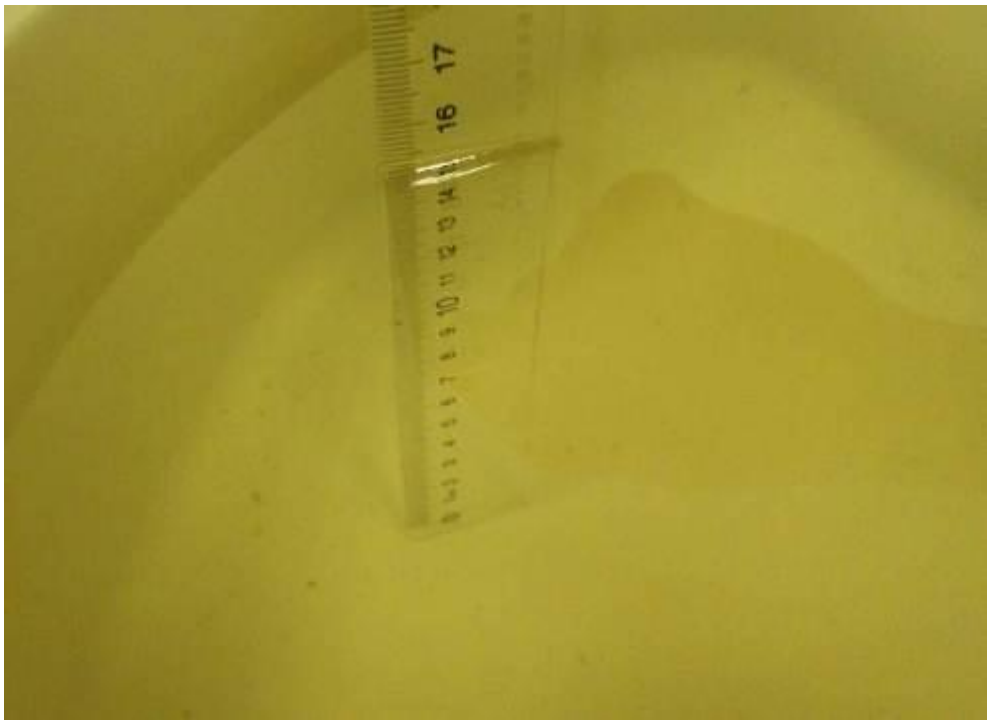
Measurement Value						
Liquid Temperature: 22.5 ℃						
Type	**Frequency**	**Permittivity ε**	**Drift (%)**	**Conductivity σ**	**Drift (%)**	Test Date
Head	835 MHz	41.51	0.02%	0.898	-0.22%	2017-01-14
Head	1900 MHz	39.63	-0.92%	1.386	-1.00%	2017-01-15
Head	2450 MHz	39.11	-0.23%	1.812	0.67%	2017-02-07
Body	835 MHz	56.16	1.74%	1.002	3.30%	2017-01-14
Body	1900 MHz	53.23	-0.13%	1.526	0.39%	2017-01-15
Body	2450 MHz	53.94	2.35%	1.921	-1.49%	2017-02-07



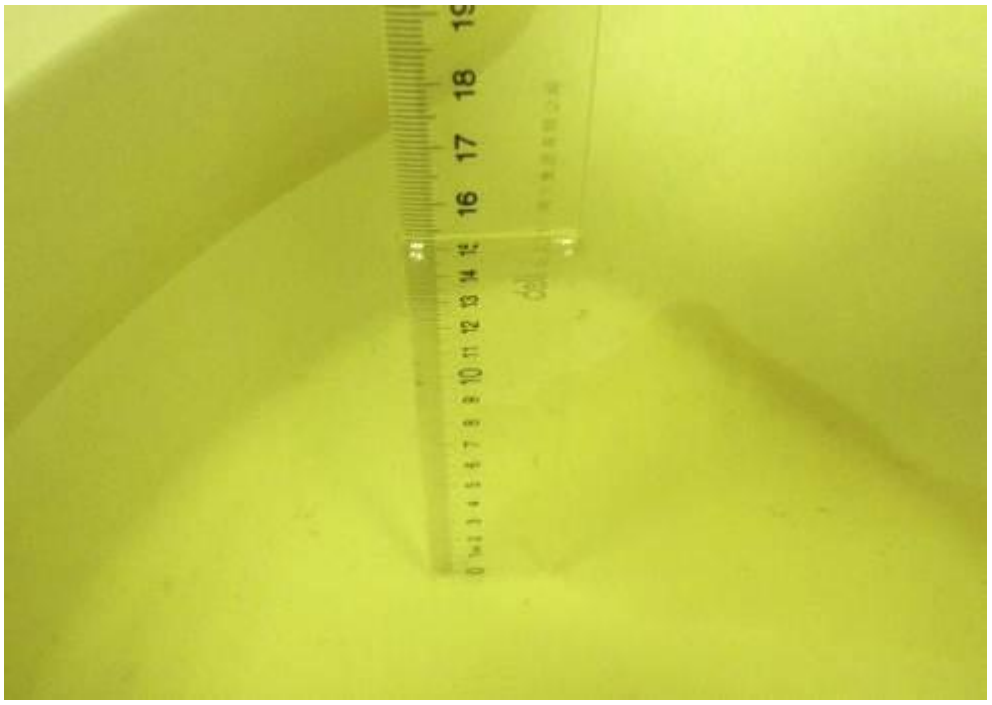
Picture 7-1: Liquid depth in the Flat Phantom (835 MHz Head)



Picture 7-2: Liquid depth in the Flat Phantom (1900 MHz Head)

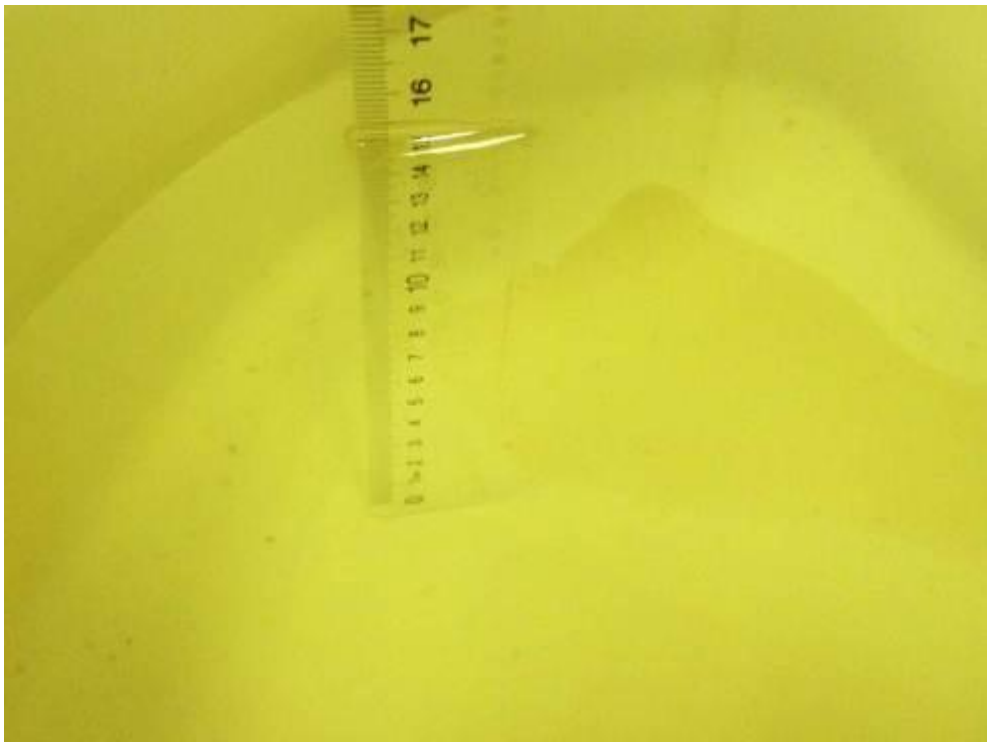


Picture 7-3: Liquid depth in the Flat Phantom (835 MHz Body)



Picture 7-4: Liquid depth in the Flat Phantom (1900 MHz Body)

Picture 7-5: Liquid depth in the Flat Phantom (2450 MHz Head)

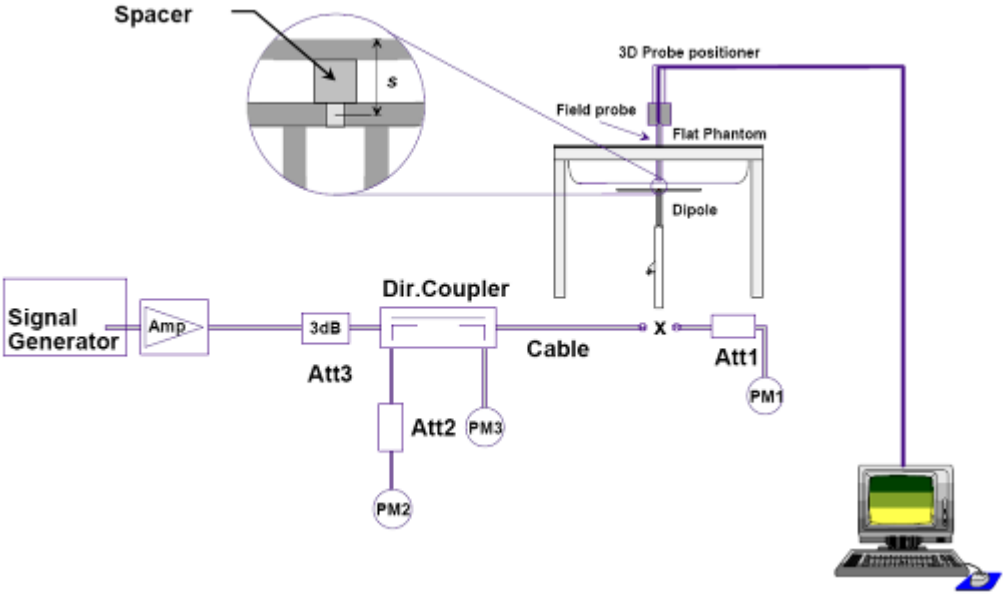


Picture 7-6: Liquid depth in the Flat Phantom (2450 MHz Body)

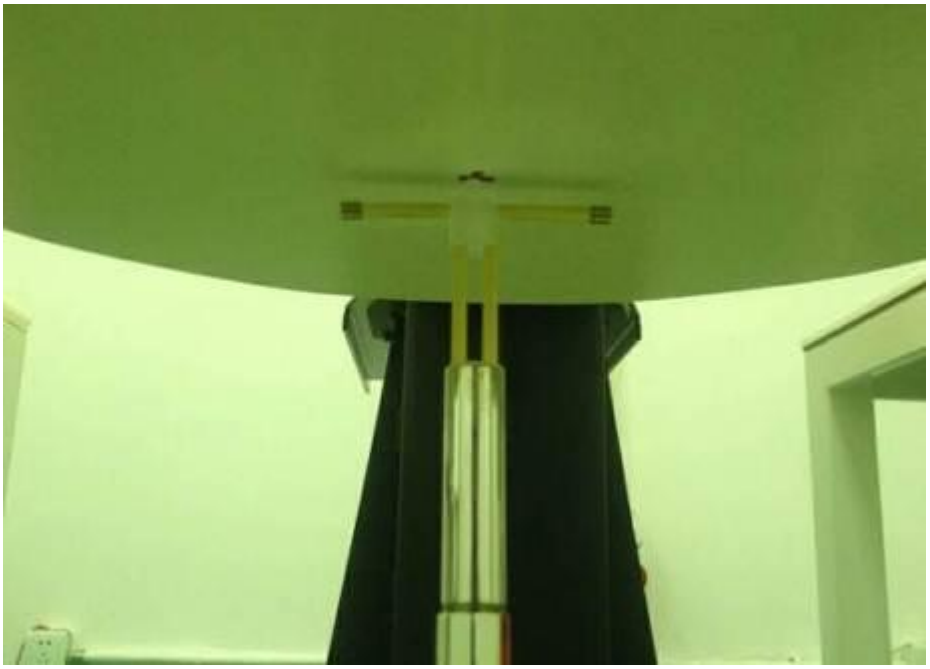
8. System verification

8.1. System Setup

In the simplified setup for system evaluation, the DUT is replaced by a calibrated dipole and the power source is replaced by a continuous wave that comes from a signal generator. The calibrated dipole must be placed beneath the flat phantom section of the SAM twin phantom with the correct distance holder. The distance holder should touch the phantom surface with a light pressure at the reference marking and be oriented parallel to the long side of the phantom. The equipment setup is shown below:



Picture 8.1 System Setup for System Evaluation



Picture 8.2 Photo of Dipole Setup

8.2. System Verification

SAR system verification is required to confirm measurement accuracy, according to the tissue dielectric media, probe calibration points and other system operating parameters required for measuring the SAR of

test device. The system verification must be performed for each frequency band and within the valid range of each probe calibration point required for testing the device.

Table 8.1: System Verification of Head

Verification Results							
Input power level: 250mW							
Frequency	Target value (W/kg)		Measured value (W/kg)		Deviation		Test date
	10 g Average	1 g Average	10 g Average	1 g Average	10 g Average	1 g Average	
835 MHz	1.51	2.31	1.50	2.30	-0.66%	-0.43%	2017-01-14
1900 MHz	5.22	10.1	5.14	9.89	-1.53%	-2.08%	2017-01-15
2450 MHz	6.06	13.2	6.13	13.4	1.16%	1.52%	2017-02-07

Table 8.2: System Verification of Body

Verification Results							
Input power level: 250mW							
Frequency	Target value (W/kg)		Measured value (W/kg)		Deviation		Test date
	10 g Average	1 g Average	10 g Average	1 g Average	10 g Average	1 g Average	
835 MHz	1.56	2.37	1.54	2.36	-1.28%	-0.42%	2017-01-14
1900 MHz	5.33	10.3	5.26	10.4	-1.31%	0.97%	2017-01-15
2450 MHz	6.16	13.2	6.11	13.1	-0.81%	-0.76%	2017-02-07

9. Measurement Procedures

9.1. Tests to be performed

In order to determine the highest value of the peak spatial-average SAR of a handset, all device positions, configurations and operational modes shall be tested for each frequency band according to steps 1 to 3 below. A flowchart of the test process is shown in Picture 11.1.

Step 1: The tests described in 11.2 shall be performed at the channel that is closest to the centre of the transmit frequency band (f_c) for:

a) all device positions (cheek and tilt, for both left and right sides of the SAM phantom, as described in Chapter 8),

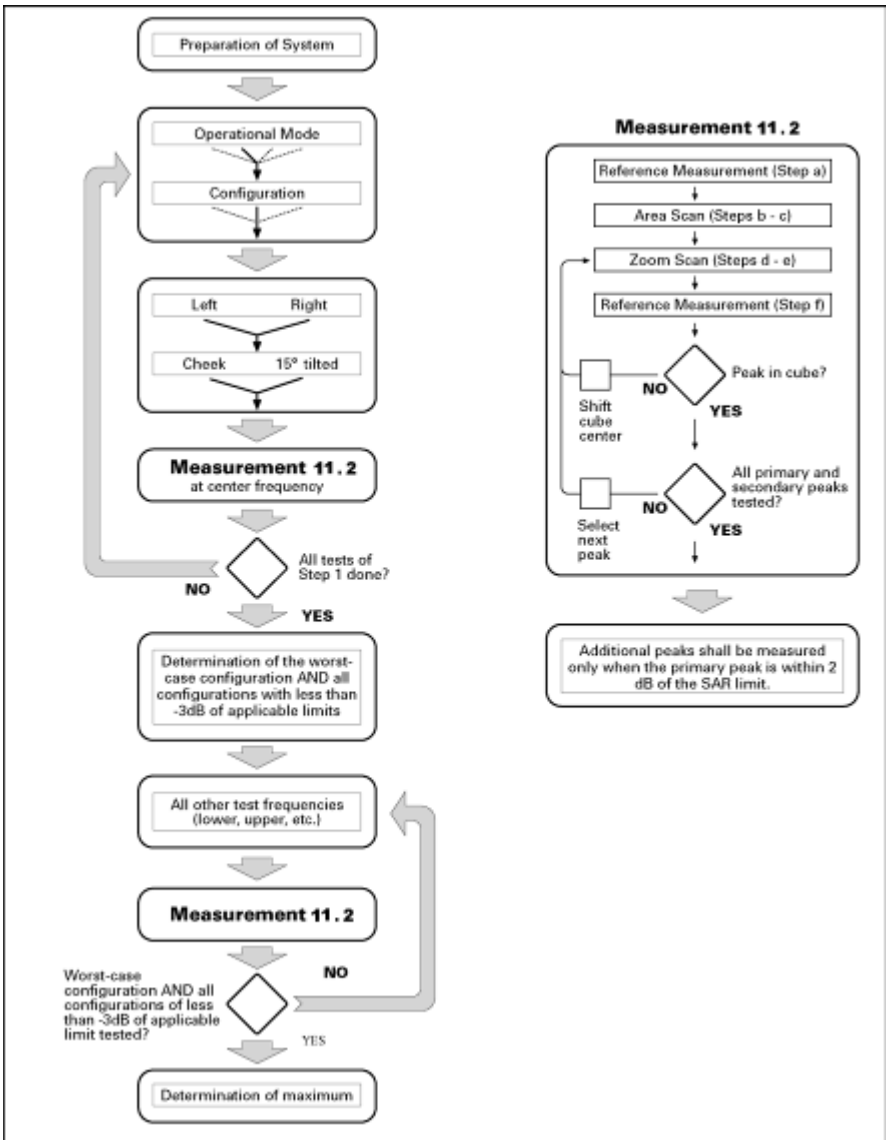
b) all configurations for each device position in a), e.g., antenna extended and retracted, and

c) all operational modes, e.g., analogue and digital, for each device position in a) and configuration in b) in each frequency band.

If more than three frequencies need to be tested according to 11.1 (i.e., N_c > 3), then all frequencies, configurations and modes shall be tested for all of the above test conditions.

Step 2: For the condition providing highest peak spatial-average SAR determined in Step 1, perform all tests described in 11.2 at all other test frequencies, i.e., lowest and highest frequencies. In addition, for all other conditions (device position, configuration and operational mode) where the peak spatial-average SAR value determined in Step 1 is within 3 dB of the applicable SAR limit, it is recommended that all other test frequencies shall be tested as well.

Step 3: Examine all data to determine the highest value of the peak spatial-average SAR found in Steps 1 to 2.



Picture 9.1Block diagram of the tests to be performed

9.2. General Measurement Procedure

The following procedure shall be performed for each of the test conditions (see Picture 11.1) described in 11.1:

a) Measure the local SAR at a test point within 8 mm or less in the normal direction from the inner surface of the phantom.

b) Measure the two-dimensional SAR distribution within the phantom (area scan procedure). The boundary of the measurement area shall not be closer than 20 mm from the phantom side walls. The distance between the measurement points should enable the detection of the location of local maximum with an accuracy of better than half the linear dimension of the tissue cube after interpolation. A maximum grip spacing of 20 mm for frequencies below 3 GHz and (60/f [GHz]) mm for frequencies of 3GHz and greater is recommended. The maximum distance between the geometrical centre of the probe detectors and the inner surface of the phantom shall be 5 mm for frequencies below 3 GHz and δ ln(2)/2 mm for frequencies of 3 GHz and greater, where δ is the plane wave skin depth and ln(x) is the natural logarithm. The maximum variation of the sensor-phantom surface shall be $\pm$1 mm for frequencies below 3 GHz and

±0.5 mm for frequencies of 3 GHz and greater. At all measurement points the angle of the probe with respect to the line normal to the surface should be less than 5°. If this cannot be achieved for a measurement distance to the phantom inner surface shorter than the probe diameter, additional uncertainty evaluation is needed.

c) From the scanned SAR distribution, identify the position of the maximum SAR value, in addition identify the positions of any local maxima with SAR values within 2 dB of the maximum value that are not within the zoom-scan volume; additional peaks shall be measured only when the primary peak is within 2 dB of the SAR limit. This is consistent with the 2 dB threshold already stated;

d) Measure the three-dimensional SAR distribution at the local maxima locations identified in step c). The horizontal grid step shall be (24/f[GHz]) mm or less but not more than 8 mm. The minimum zoom size of 30 mm by 30 mm and 30 mm for frequencies below 3 GHz. For higher frequencies, the minimum zoom size of 22 mm by 22 mm and 22 mm. The grip step in the vertical direction shall be (8-f[GHz]) mm or less but not more than 5 mm, if uniform spacing is used. If variable spacing is used in the vertical direction, the maximum spacing between the two closest measured points to the phantom shell shall be (12 / f[GHz]) mm or less but not more than 4 mm, and the spacing between father points shall increase by an incremental factor not exceeding 1.5. When variable spacing is used, extrapolation routines shall be tested with the same spacing as used in measurements. The maximum distance between the geometrical centre of the probe detectors and the inner surface of the phantom shall be 5 mm for frequencies below 3 GHz and δ In(2)/2 mm for frequencies of 3 GHz and greater, where δ is the plane wave skin depth and In(x) is the natural logarithm. Separate grids shall be centered on each of the local SAR maxima found in step c). Uncertainties due to field distortion between the media boundary and the dielectric enclosure of the probe should also be minimized, which is achieved is the distance between the phantom surface and physical tip of the probe is larger than probe tip diameter. Other methods may utilize correction procedures for these boundary effects that enable high precision measurements closer than half the probe diameter. For all measurement points, the angle of the probe with respect to the flat phantom surface shall be less than 5°. If this cannot be achieved an additional uncertainty evaluation is needed.

e) Use post processing(e.g. interpolation and extrapolation) procedures to determine the local SAR values at the spatial resolution needed for mass averaging.

9.3. WCDMA Measurement Procedures for SAR

The following procedures are applicable to WCDMA handsets operating under 3GPP Release99, Release 5 and Release 6. The default test configuration is to measure SAR with an established radio link between the DUT and a communication test set using a 12.2kbps RMC (reference measurement channel) configured in Test Loop Mode 1. SAR is selectively confirmed for other physical channel configurations (DPCCH &DPDCH$_n$), HSDPA and HSPA (HSUPA/HSDPA) modes according to output power, exposure conditions and device operating capabilities. Both uplink and downlink should be configured with the same RMC or AMR, when required. SAR for Release 5 HSDPA and Release 6 HSPA are measured using the applicable FRC (fixed reference channel) and E-DCH reference channel configurations. Maximum output power is verified according to applicable versions of 3GPP TS 34.121 and SAR must be measured according to these maximum output conditions. When Maximum Power Reduction (MPR) is not implemented according to Cubic Metric (CM) requirements for Release 6 HSPA, the following procedures do not apply.

For Release 5 HSDPA Data Devices:

Sub-test	β_c	β_d	β_d （SF）	β_c / β_d	β_{hs}	CM/dB	MPR/dB
1	2/15	15/15	64	2/15	4/15	2.0	1.0
2	12/15	15/15	64	12/15	24/25	2.0	1.0
3	15/15	8/15	64	15/8	30/15	2.0	1.0
4	15/15	4/15	64	15/4	30/15	2.0	1.0

For Release 6 HSUPA Data Devices

Sub-test	β_c	β_d	β_d （SF）	β_c / β_d	β_{hs}	β_{ec}	β_{ed}	β_{ed} （SF）	β_{ed} （codes）	CM (dB)	MPR (dB)	AG Index	E-TFCI
1	11/15	15/15	64	11/15	22/15	209/225	1039/225	4	1	2.0	1.0	20	75
2	6/15	15/15	64	6/15	12/15	12/15	12/15	4	1	2.0	1.0	12	67
3	15/15	9/15	64	15/9	30/15	30/15	β_{ed1}:47/15 β_{ed2}:47/15	4	2	2.0	1.0	15	92
4	2/15	15/15	64	2/15	4/15	4/15	56/75	4	1	2.0	1.0	17	71
5	15/15	15/15	64	15/15	24/15	30/15	134/15	4	1	2.0	1.0	21	81

9.4. SAR Measurement for LTE

SAR tests for LTE are performed with a base station simulator, Anritsu 8820. Closed loop power control was used so the UE transmits with maximum output power during SAR testing. All powers were measured with the Anritsu 8820

It is performed for conducted power and SAR based on the KDB941225 D05.

SAR is evaluated separately according to the following procedures for the different test positions in each exposure condition – head, body, body-worn accessories and other use conditions. The procedures in the following subsections are applied separately to test each LTE frequency band

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 among 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 ≤ 0.8W/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.

9.5. Bluetooth & Wi-Fi Measurement Procedures for SAR

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

Chipset based test mode software is hardware dependent and generally varies among manufacturers. The device operating parameters established in a test mode for SAR measurements must be identical to those programmed in production units, including output power levels, amplifier gain settings and other RF performance tuning parameters. The test frequencies should correspond to actual channel frequencies defined for domestic use. SAR for devices with switched diversity should be measured with only one antenna transmitting at a time during each SAR measurement, according to a fixed modulation and data rate. The same data pattern should

be used for all measurements.

9.6. Power Drift

To control the output power stability during the SAR test, DASY4 system calculates the power drift by measuring the E-field at the same location at the beginning and at the end of the measurement for each test position. These drift values can be found in Section 14 labeled as: (Power Drift [dB]). This ensures that the power drift during one measurement is within 5%.

10. Area Scan Based 1-g SAR

10.1 Requirement of KDB

According to the KDB447498 D01 v06, when the implementation is based the specific polynomial fit algorithm as presented at the 29th Bioelectromagnetics Society meeting (2007) and the estimated 1-g SAR is ≤ 1.2 W/kg, a zoom scan measurement is not required provided it is also not needed for any other purpose; for example, if the peak SAR location required fo simultaneous transmission SAR test exclusion can be determined accurately by the SAR system or manually to discriminate between distinctive peaks and scattered noisy SAR distributions from area scans.

There must not be any warning or alert messages due to various measurement concerns identified by the SAR system; for example, noise in measurements, peaks too close to scan boundary, peaks are too sharp, spatial resolution and uncertainty issues etc. The SAR system verification must also demonstrate that the area scan estimated 1-g SAR is within 3% of the zoom scan 1-g SAR (See Annex B). When all the SAR results for each exposure condition in a frequency band and wireless mode are based on estimated 1-g SAR, the 1-g SAR for the highest SAR configuration must be determined by a zoom scan.

10.2 Fast SAR Algorithms

The approach is based on the area scan measurement applying a frequency dependent attenuation parameter. This attenuation parameter was empirically determined by analyzing a large number of phones. The MOTOROLA FAST SAR was developed and validated by the MOTOROLA Research Group in Ft. Lauderdale.

In the initial study, an approximation algorithm based on Linear fit was developed. The accuracy of the algorithm has been demonstrated across a broad frequency range (136-2450 MHz) and for both 1- and 10-g averaged SAR using a sample of 264 SAR measurements from 55 wireless handsets. For the sample size studied, the root-mean-squared errors of the algorithm are 1.2% and 5.8% for 1- and 10-g averaged SAR, respectively. The paper describing the algorithm in detail is expected to be published in August 2004 within the Special Issue of Transactions on MTT.

In the second step, the same research group optimized the fitting algorithm to an Polynomial fit whereby the frequency validity was extended to cover the range 30-6000MHz. Details of this study can be found in the BEMS 2007 Proceedings.

Both algorithms are implemented in DASY software.

11. Conducted Output Power

11.1. Manufacturing tolerance

Table 11.1: GSM Speech

GSM 850			
Channel	Channel 128	Channel 190	Channel 251
Maximum Target Value (dBm)	32	32	32
GSM1900			
Channel	Channel 512	Channel 661	Channel 810
Maximum Target Value (dBm)	29	29	29

Table 11.2: GPRS/EGPRS (GMSK Modulation)

GSM 850				
Channel		**128**	**190**	**251**
1 Txslots	Maximum Target Value (dBm)	32	32	32
2 Txslots	Maximum Target Value (dBm)	30	30	30
3 Txslots	Maximum Target Value (dBm)	28	28	28
4 Txslots	Maximum Target Value (dBm)	26	26	26
GSM 1900				
Channel		**512**	**661**	**810**
1 Txslots	Maximum Target Value (dBm)	29	29	29
2 Txslots	Maximum Target Value (dBm)	27	27	27
3 Txslots	Maximum Target Value (dBm)	25.5	25.5	25.5
4 Txslots	Maximum Target Value (dBm)	23	23	23

Table 11.3: WCDMA

WCDMA Band II			
Channel	Channel 9262	Channel 9400	Channel 9538
Maximum Target Value (dBm)	22	22	22

Table 11.4: HSDPA

WCDMA Band II					MPR (dB)
Channel		9262	9400	9538	
1	Maximum Target Value (dBm)	21.5	21.5	21.5	1
2	Maximum Target Value (dBm)	21	21	21	1
3	Maximum Target Value (dBm)	21	21	21	1
4	Maximum Target Value (dBm)	21	21	21	1

Table 11.6: HSUPA

WCDMA Band II					MPR (dB)
Channel		9262	9400	9538	
1	Maximum Target Value (dBm)	21	21	21	1
2	Maximum Target Value (dBm)	21	21	21	1
3	Maximum Target Value (dBm)	21	21	21	1
4	Maximum Target Value (dBm)	21	21	21	1
5	Maximum Target Value (dBm)	21	21	21	1

Table 11.7: WCDMA

WCDMA Band V			
Channel	4233	4182	4132
Maximum Target Value (dBm)	23	23	23

Table 11.8: HSDPA

WCDMA Band V					MPR (dB)
Channel		4233	4182	4132	
1	Maximum Target Value (dBm)	22.5	22.5	22.5	1
2	Maximum Target Value (dBm)	22.5	22.5	22.5	1
3	Maximum Target Value (dBm)	22	22	22	1
4	Maximum Target Value (dBm)	22	22	22	1

Table 11.9: HSUPA

WCDMA Band V					MPR (dB)
Channel		4233	4182	4132	
1	Maximum Target Value (dBm)	22	22	22	1
2	Maximum Target Value (dBm)	22	22	22	1
3	Maximum Target Value (dBm)	22	22	22	1
4	Maximum Target	22.5	22.5	22.5	1

	Value (dBm)				
5	Maximum Target Value (dBm)	22	22	22	1

Table 11.10: WiFi

802.11b			
Channel	Channel 1	Channel 6	Channel 11
Maximum Target Value (dBm)	10	10	10
802.11g			
Channel	Channel 1	Channel 6	Channel 11
Maximum Target Value (dBm)	8	8	8
802.11n			
Channel	Channel 1	Channel 6	Channel 11
Maximum Target Value (dBm)	5	5	5

Table 11.11: Bluetooth

Bluetooth 2.1			
Channel	Channel 0	Channel 39	Channel 78
Maximum Target Value (dBm)	4.5	4.5	4.5

11.2. GSM Measurement result

During the process of testing, the EUT was controlled via Agilent Digital Radio Communication tester (E5515C) to ensure the maximum power transmission and proper modulation. This result contains conducted output power for the EUT. In all cases, the measured peak output power should be greater and within 5% than EMI measurement.

Table 11.13: The conducted power measurement results for GSM

GSM 850MHZ	**Conducted Power (dBm)**		
	Channel 128(824.2MHz)	**Channel 190(836.6MHz)**	**Channel 251(848.6MHz)**
	31.17	**31.28**	**31.31**
GSM 1900MHZ	**Conducted Power (dBm)**		
	Channel 512(1850.2MHz)	**Channel 661(1880MHz)**	**Channel 810(1909.8MHz)**
	28.64	**28.46**	**28.63**

Table 11.14: The conducted power measurement results for GPRS/EGPRS（GMSK）

GSM 850 GPRS/EGPRS	Measured Power (dBm)			calculation	Averaged Power (dBm)		
	128	**190**	**251**		**128**	**190**	**251**
1 Txslot	**31.16**	**31.29**	**31.3**	-9.03dB	22.13	22.26	22.27
2 Txslots	29.82	29.96	29.93	-6.02dB	23.8	23.94	23.91
3 Txslots	27.96	28.07	28.08	-4.26dB	23.7	23.81	23.82
4 Txslots	25.85	25.93	25.96	-3.01dB	22.84	22.92	22.95
GSM 1900 GPRS/EGPRS	Measured Power (dBm)			calculation	Averaged Power (dBm)		
	512	**661**	**810**		**512**	**661**	**810**
1 Txslot	**28.64**	**28.45**	**28.62**	-9.03dB	19.61	19.42	19.59
2 Txslots	26.67	26.54	26.34	-6.02dB	20.65	20.52	20.32
3 Txslots	25.14	25.03	24.82	-4.26dB	20.88	20.77	20.56
4 Txslots	22.93	22.82	22.67	-3.01dB	19.92	19.81	19.66

NOTES:

1) Division Factors

To average the power, the division factor is as follows:

1TX-slot = 1 transmit time slot out of 8 time slots=> conducted power divided by (8/1) => -9.03dB

2TX-slots = 2 transmit time slots out of 8 time slots=> conducted power divided by (8/2) => -6.02dB

3TX-slots = 3 transmit time slots out of 8 time slots=> conducted power divided by (8/3) => -4.26dB

4TX-slots = 4 transmit time slots out of 8 time slots=> conducted power divided by (8/4) => -3.01dB

According to the conducted power as above, the body measurements are performed with 2Txslots for 850MHz ; 3Txslots for1900MHz;

11.3. WCDMA Measurement result

Table 11.16: The conducted Power for WCDMA

Item	band	WCDMA BAND II result(dBm)		
	ARFCN	9612 (1922.4MHz)	9750 (1950.0MHz)	9888 (1977.6MHz)
WCDMA	\	21.26	21.24	21.19
HSDPA	1	20.03	19.9	19.77
	2	19.83	19.86	19.94
	3	19.49	19.41	19.38
	4	19.61	19.51	19.45
HSUPA	1	19.39	19.51	19.54
	2	18.94	18.85	18.88
	3	18.93	18.99	18.81
	4	19.74	19.69	19.72
	5	19.54	19.59	19.61
Item	band	WCDMA BAND V result(dBm)		
	ARFCN	4133 (826.4MHz)	4182 (836.4MHz)	4232 (846.6MHz)
WCDMA	\	22.44	22.59	22.38
HSDPA	1	21.19	21.35	21.06
	2	20.99	21.27	21.12
	3	20.72	20.86	20.67
	4	20.82	20.89	20.67
HSUPA	1	20.62	20.86	20.7
	2	20.09	20.27	20.01
	3	20.09	20.32	20.05
	4	21.02	21.09	20.93
	5	20.73	20.92	20.76

11.4. Wi-Fi and BT Measurement result

Table 11.18: The conducted power for Bluetooth

GFSK			
Channel	Ch0 (2402 MHz)	Ch39 (2441MHz)	CH78 (2480MHz)
Conducted Output Power (dBm)	3.14	2.86	2.90
π /4 DQPSK			
Channel	Ch0 (2402 MHz)	Ch39 (2441MHz)	CH78 (2480MHz)
Conducted Output Power (dBm)	4.04	3.72	3.70
8DPSK			
Channel	Ch0 (2402 MHz)	Ch39 (2441MHz)	CH78 (2480MHz)
Conducted Output Power (dBm)	4.17	3.82	3.85

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

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

(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] • [√f(GHz)/x] W/kg for test separation distances ≤ 50 mm;
where x = 7.5 for 1-g SAR, and x = 18.75 for 10-g SAR.

SAR head value of BT is 0.118 W/Kg. SAR body value of BT is 0.059 W/Kg.

The default power measurement procedures are:

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

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

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

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

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

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

Table 11.19: The average conducted power for WiFi

Mode	Channel	Frequence	Average power(dBm)
802.11 b	1	2412 MHZ	8.51
	6	2437 MHZ	8.63
	11	2462 MHZ	8.47
802.11 g	1	2412 MHZ	7.37
	6	2437 MHZ	7.26
	11	2462 MHZ	7.24
802.11 n 20M	1	2412 MHZ	4.17
	6	2437 MHZ	3.64
	11	2462 MHZ	3.72

2.4 GHz 802.11g/n OFDM SAR Test Exclusion Requirements

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

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

b) When the highest *reported* SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.

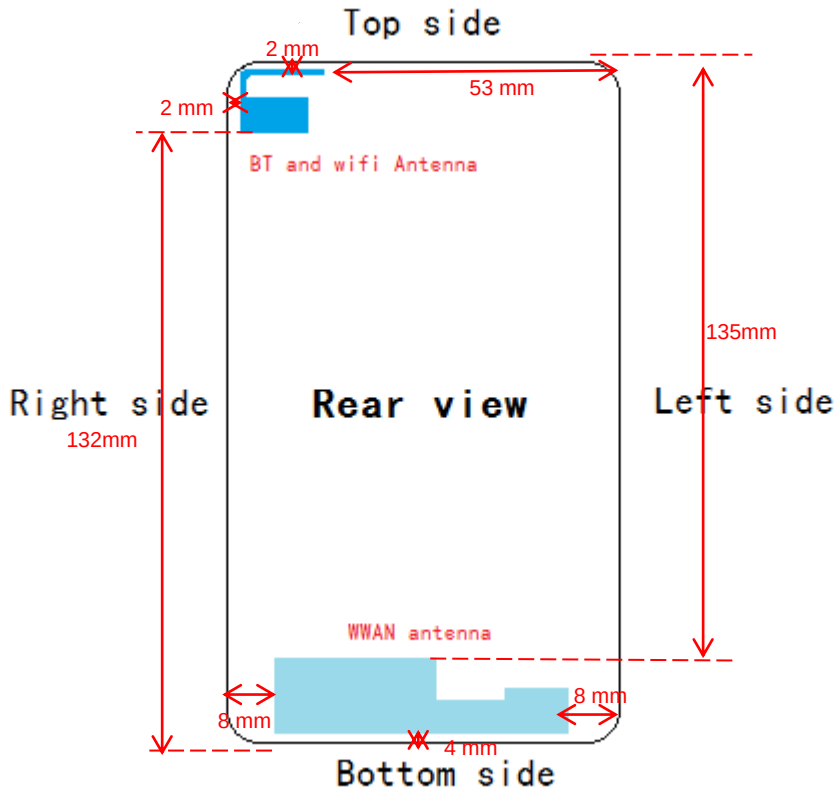
12. Simultaneous TX SAR Considerations

12.1. Introduction

The following procedures adopted from “FCC SAR Considerations for Cell Phones with Multiple Transmitters” are applicable to handsets with built-in unlicensed transmitters such as 802.11 a/b/g and Bluetooth devices which may simultaneously transmit with the licensed transmitter.

For this device, the BT and Wi-Fi can transmit simultaneous with other transmitters.

12.2. Transmit Antenna Separation Distances



Picture 12.1 Antenna Locations

Note:

WWAN Antenna meaning is 2G/3G TX Antenna

12.3. Standalone SAR Test Exclusion Considerations

Standalone 1-g head or body SAR evaluation by measurement or numerical simulation is not required when the corresponding SAR Exclusion Threshold condition, listed below, is satisfied. The 1-g SAR test exclusion threshold for 100 MHz to 6 GHz at test separation distances≤ 50 mm are determined by:

[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] · [√f(GHz)] ≤ 3.0 for 1-g SAR, where

- f(GHz) is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison

According to the KDB447498 appendix A, the SAR test exclusion threshold for 2450MHz at 5mm test separation distances is 10mW.

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

Based on the above equation, Bluetooth SAR was not required:

Evaluation=0.888 ＜3.0

Based on the above equation, WiFi SAR was required:

Evaluation=3.15 > 3.0

12.4. SAR Measurement Positions

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

SAR Measurement Positions						
Antenna Mode	Phantom	Ground	Left	Right	Top	Bottom
WWAN	Yes	Yes	Yes	Yes	No	Yes
WLAN	Yes	Yes	No	Yes	Yes	No

13. Evaluation of Simultaneous

Table 13.1: Summary of Transmitters

Band/Mode	Frequency (GHz)	SAR test exclusion threshold(mW)	RF output power (mW)
Bluetooth	2.41	10	3.16
2.4GHz WLAN 802.11 b/g/n	2.45	10	10

Table13.2 Simultaneous transmission SAR

Standalone SAR for 2G(W/Kg)					
Test Position			GSM 850	GSM 1900	Highest SAR
Head voice	Left	Cheek	0.437	0.195	0.437
		Tilt 15°	0.270	0.095	0.270
	Right	Cheek	0.302	0.181	0.302
		Tilt 15°	0.251	0.100	0.251
Hotspot 10mm	Phantom Side		0.279	0.631	0.631
	Ground Side		0.691	0.881	0.881
	Left Side		0.271	0.143	0.271
	Right Side		0.226	0.347	0.347
	Bottom Side		0.157	0.679	0.679
	Top Side		--	--	--

Standalone SAR for 3G (W/Kg)					
Test Position			WCDMA Band II	WCDMA Band V	Highest SAR
Head data	Left	Cheek	0.199	0.269	0.269
		Tilt 15°	0.057	0.189	0.189
	Right	Cheek	0.227	0.302	0.302
		Tilt 15°	0.109	0.226	0.226
Hotspot 10mm	Phantom Side		0.500	0.403	0.500
	Ground Side		0.521	0.609	0.609
	Left Side		0.149	0.287	0.287
	Right Side		0.179	0.207	0.207
	Bottom Side		0.781	0.130	0.781
	Top Side		--	--	--

Transmission SAR(W/Kg)							
Test Position			2G	3G	WIFI	BT	SUM
Head	Left	Cheek	0.437	0.269	0.419	0.118	0.856
		Tilt 15°	0.270	0.189	0.265	0.118	0.535
	Right	Cheek	0.302	0.302	0.107	0.118	0.420
		Tilt 15°	0.251	0.226	0.096	0.118	0.369
Hotspot 10mm	Phantom Side		0.631	0.500	0.041	0.059	0.690
	Ground Side		0.881	0.609	0.038	0.059	0.940
	Left Side		0.271	0.287	0.008	0.059	0.346
	Right Side		0.347	0.207	0.034	0.059	0.406
	Bottom Side		0.679	0.781	--	0.059	0.840
	Top Side				0.008	0.059	0.059

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

14. SAR Test Result

14.1. SAR results for Fast SAR

Table 14.1: Duty Cycle

Duty Cycle	
Speech for GSM900/1800	1:8.3
GPRS for GSM900/1800	1:2
WCDMA Band I/ Band V/and WiFi	1:1

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

Frequency		Side	Test Position	Figure No.	Measured average power(dBm)	Maximum allowed Power (dBm	Scaling factor	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.									
836.6	190	Left	Touch	/	31.28	32	1.180	0.298	0.352	0.01
836.6	190	Left	Tilt	/	31.28	32	1.180	0.229	0.270	0.03
836.6	190	Right	Touch	/	31.28	32	1.180	0.256	0.302	0.12
836.6	190	Right	Tilt	/	31.28	32	1.180	0.213	0.251	0.05
824.2	128	Left	Touch	/	31.17	32	1.211	0.293	0.355	-0.07
848.8	251	Left	Touch	Fig.1	31.31	32	1.172	0.373	0.437	0.08

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

Frequency		Side	Test Position	Figure No.	Measured average power(dBm)	Maximum allowed Power (dBm	Scaling factor	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.									
1880	661	Left	Touch	Fig.2	28.46	29	1.132	0.172	0.195	0.10
1880	661	Left	Tilt	/	28.46	29	1.132	0.0835	0.095	0.03
1880	661	Right	Touch	/	28.46	29	1.132	0.160	0.181	-0.10
1880	661	Right	Tilt	/	28.46	29	1.132	0.0881	0.100	0.10
1850.2	512	Left	Touch	/	28.64	29	1.086	0.171	0.186	0.13
1909.8	810	Left	Touch	/	28.63	29	1.089	0.138	0.150	-0.14

Table 14.4: SAR Values (WCDMA Band II- Head)

Frequency		Side	Test Position	Figure No.	Measured average power(dBm)	Maximum allowed Power (dBm	Scaling factor	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.									
1880	9800	Left	Touch	/	21.24	21.5	1.062	0.187	0.199	0.13
1880	9800	Left	Tilt	/	21.24	21.5	1.062	0.0541	0.057	-0.14
1880	9800	Right	Touch		21.24	21.5	1.062	0.210	0.223	-0.03
1880	9800	Right	Tilt	/	21.24	21.5	1.062	0.103	0.109	0.00

1852.4	9662	Right	Touch	Fig.3	21.26	21.5	1.057	0.215	0.227	-0.03
1907.6	9938	Right	Touch	/	21.19	21.5	1.074	0.180	0.193	0.13

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

Frequency		Side	Test Position	Figure No.	Measured average power(dBm)	Maximum allowed Power (dBm	Scaling factor	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.									
836.6	4182	Left	Touch	/	22.59	23	1.099	0.245	0.269	0.13
836.6	4182	Left	Tilt	/	22.59	23	1.099	0.172	0.189	-0.04
836.6	4182	Right	Touch		22.59	23	1.099	0.252	0.277	0.12
836.6	4182	Right	Tilt	/	22.59	23	1.099	0.206	0.226	0.10
826.4	4132	Right	Touch	/	22.44	23	1.138	0.204	0.232	0.12
846.6	4232	Right	Touch	Fig.4	22.38	23	1.153	0.262	0.302	0.11

Table 14.6:SAR Values (WiFi2450- Head)

Frequency		Side	Test Position	Figure No.	Measured average power(dBm)	Maximum allowed Power (dBm	Scaling factor	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.									
2412	1	Left	Touch	Fig.5	8.63	10	1.371	0.306	0.419	0.09
2412	1	Left	Touch	/	8.63	10	1.371	0.193	0.265	0.12
2412	1	Right	Touch		8.63	10	1.371	0.0782	0.107	0.09
2412	1	Right	Tilt	/	8.63	10	1.371	0.0698	0.096	0.13
Second supply										
2412	1	Left	Touch	Fig.6	8.63	10	1.371	0.022	0.030	-0.15

Table 14.7: SAR Values (GSM 850 MHz Band–Hotspot)

Frequency		Mode (number of timeslots)	Test Position	Figure No.	Measured average power(dBm)	Maximum allowed Power (dBm	Scaling factor	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.									
836.6	190	GPRS (2)	Phantom	/	29.96	30	1.009	0.276	0.279	0.13
836.6	190	GPRS (2)	Ground	/	29.96	30	1.009	0.446	0.450	0.16
836.6	190	GPRS (2)	Left	/	29.96	30	1.009	0.269	0.271	0.18
836.6	190	GPRS (2)	Right	/	29.96	30	1.009	0.224	0.226	0.13
836.6	190	GPRS (2)	Bottom	/	29.96	30	1.009	0.156	0.157	0.07
824.2	128	GPRS (2)	Ground	/	29.82	30	1.042	0.549	0.572	0.13
848.8	251	GPRS (2)	Ground	Fig.7	29.93	30	1.016	0.68	0.691	0.15
Second supply										
848.8	251	GPRS (2)	Ground	Fig.8	29.93	30	1.016	0.486	0.494	0.14

Note: The distance between the EUT and the phantom bottom is 10mm.

Table 14.8: SAR Values (GSM 1900 MHz Band–Hotspot)

Frequency		Mode (number of timeslots)	Test Position	Figure No.	Measured average power(dBm)	Maximum allowed Power (dBm	Scaling factor	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.									
1880	661	GPRS (3)	Phantom	/	25.03	25.5	1.114	0.566	0.631	-0.12
1880	661	GPRS (3)	Ground	/	25.03	25.5	1.114	0.650	0.724	0.01
1880	661	GPRS (3)	Left	/	25.03	25.5	1.114	0.128	0.143	0.14
1880	661	GPRS (3)	Right	/	25.03	25.5	1.114	0.311	0.347	0.13
1880	661	GPRS (3)	Bottom	/	25.03	25.5	1.114	0.609	0.679	0.16
1850.2	512	GPRS (3)	Ground		25.14	25.5	1.086	0.554	0.602	0.18
1909.8	810	GPRS (3)	Ground	Fig.9	24.82	25.5	1.169	0.753	0.881	-0.13
Second supply										
1909.8	810	GPRS (3)	Ground	Fig.10	24.82	25.5	1.169	0.684	0.800	0.18
SIM2										
1909.8	810	GPRS (3)	Ground	/	24.82	25.5	1.169	0.667	0.779	0.12

Note:The distance between the EUT and the phantom bottom is 10mm.

Table 14.9:SAR Values (WCDMA Band II –Hotspot)

Frequency		Mode (number of timeslots)	Test Position	Figure No.	Measured average power(dBm)	Maximum allowed Power (dBm	Scaling factor	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.									
1880	9800	12.2K RMC	Phantom	/	21.24	21.5	1.062	0.471	0.500	0.10
1880	9800	12.2K RMC	Ground	/	21.24	21.5	1.062	0.491	0.521	0.13
1880	9800	12.2K RMC	Left	/	21.24	21.5	1.062	0.140	0.149	-0.14
1880	9800	12.2K RMC	Right	/	21.24	21.5	1.062	0.169	0.179	-0.03
1880	9800	12.2K RMC	Bottom		21.24	21.5	1.062	0.629	0.668	0.00
1852.4	9662	12.2K RMC	Bottom	/	21.26	21.5	1.057	0.575	0.608	0.15
1907.6	9938	12.2K RMC	Bottom	Fig.11	21.19	21.5	1.074	0.727	0.781	0.20
Second supply										
1907.6	9938	12.2K RMC	Bottom	Fig.12	21.19	21.5	1.074	0.698	0.750	0.14

Note: The distance between the EUT and the phantom bottom is 10mm.

Table 14.10: SAR Values (WCDMA Band V –Hotspot)

Frequency		Mode (number of timeslots)	Test Position	Figure No.	Measured average power(dBm)	Maximum allowed Power (dBm	Scaling factor	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.									
836.6	4175	12.2K RMC	Phantom	/	22.59	23	1.099	0.367	0.403	0.12
836.6	4175	12.2K RMC	Ground	/	22.59	23	1.099	0.519	0.570	0.10
836.6	4175	12.2K RMC	Left	/	22.59	23	1.099	0.261	0.287	0.12
836.6	4175	12.2K RMC	Right	/	22.59	23	1.099	0.188	0.207	0.09
836.6	4175	12.2K RMC	Bottom	/	22.59	23	1.099	0.118	0.130	0.13
826.4	4132	12.2K RMC	Ground	/	22.44	23	1.138	0.494	0.562	0.11
846.6	4232	12.2K RMC	Ground	Fig.13	22.38	23	1.153	0.528	0.609	0.09
Second supply										
846.6	4232	12.2K RMC	Ground	Fig.14	22.38	23	1.153	0.418	0.482	0.04

Note: The distance between the EUT and the phantom bottom is 10mm.

Table 14.11:SAR Values (WiFi2450 –Hotspot)

Frequency		Mode (number of timeslots)	Test Position	Figure No.	Measured average power(dBm)	Maximum allowed Power (dBm	Scaling factor	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.									
2412	1	802.11 b	Phantom	Fig.15	8.63	10	1.371	0.030	0.041	-0.13
2412	1	802.11 b	Ground	/	8.63	10	1.371	0.028	0.038	0.03
2412	1	802.11 b	Left	/	8.63	10	1.371	0.006	0.008	0.16
2412	1	802.11 b	Right	/	8.63	10	1.371	0.025	0.034	0.18
2412	1	802.11 b	Top	/	8.63	10	1.371	0.006	0.008	0.13

Note: The distance between the EUT and the phantom bottom is 10mm.

SAR results for Standard procedure

There is zoom scan measurement to be added for the highest measured SAR in each exposure configuration/band.

Table 14.12: SAR Values for Head

Frequency		Side	Test Position	Figure No.	Measured average power(dBm)	Maximum allowed Power (dBm	Scaling factor	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.									
848.8	251	Left	Touch	Fig.1	31.31	32	1.172	0.373	0.437	0.08
1880	661	Left	Touch	Fig.2	28.46	29	1.132	0.172	0.195	0.10
1852.4	9662	Right	Touch	Fig.3	21.26	21.5	1.057	0.215	0.227	-0.03
846.6	4232	Left	Touch	Fig.4	22.38	23	1.153	0.262	0.302	0.11
2412	1	Left	Touch	Fig.5	8.63	10	1.371	0.306	0.419	0.09
2412	1	Left	Touch	Fig.6	8.63	10	1.371	0.022	0.030	-0.15

Table 14.13: SAR Values for Hotspot/Body worn

Frequency		Mode (number of timeslots)	Test Position	Figure No.	Measured average power(dBm)	Maximum allowed Power (dBm	Scaling factor	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.									
848.8	251	GPRS (2)	Ground	Fig.7	29.93	30	1.016	0.68	0.691	0.15
848.8	251	GPRS (2)	Ground	Fig.8	29.93	30	1.016	0.486	0.494	0.14
1909.8	810	GPRS (3)	Ground	Fig.9	24.82	25.5	1.169	0.753	0.881	-0.13
1909.8	810	GPRS (3)	Ground	Fig.10	24.82	25.5	1.169	0.684	0.800	0.18
1907.6	9938	12.2K RMC	Bottom	Fig.11	21.19	21.5	1.074	0.727	0.781	0.20
1907.6	9938	12.2K RMC	Bottom	Fig.12	21.19	21.5	1.074	0.698	0.750	0.14
846.6	4232	12.2K RMC	Ground	Fig.13	22.38	23	1.153	0.528	0.609	0.09
846.6	4232	12.2K RMC	Ground	Fig.14	22.38	23	1.153	0.418	0.482	0.04
2412	1	802.11 b	Phantom	Fig.15	8.63	10	1.371	0.030	0.041	-0.13

15. SAR Measurement Variability

SAR measurement variability must be assessed for each frequency band, which is determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. When both head and body tissue-equivalent media are required for SAR measurements in a frequency band, the variability measurement procedures should be applied to the tissue medium with the highest measured SAR, using the highest measured SAR configuration for that tissue-equivalent medium.

The following procedures are applied to determine if repeated measurements are required.

1) Repeated measurement is not required when the original highest measured SAR is < 0.80 W/kg; steps2) through 4) do not apply.

2) When the original highest measured SAR is ≥ 0.80 W/kg, repeat that measurement once.

3) Perform a second repeated measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is > 1.20 or when the original or repeated measurement is ≥ 1.45W/kg (~ 10% from the 1-g SAR limit).

4) Perform a third repeated measurement only if the original, first or second repeated measurement is ≥1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.

Table 15.1: SAR Measurement Variability for Body Value (1g)

Frequency		Test Position	Original SAR (W/kg)	First Repeated SAR (W/kg)	second repeated (1g)(W/kg)	The Ratio
MHz	Ch.					
N/A	N/A	N/A	N/A	N/A	N/A	N/A

Note: According to the KDB 865664 D01repeated measurement is not required when the original highest measured SAR is < 0.8 W/kg.

16. Measurement Uncertainty

Error Description	Unc. value, ±%	Prob. Dist.	Div.	c_i 1g	c_i 10g	Std.Unc. ±%,1g	Std.Unc. ±%,10g	V_i v_{eff}
Measurement System								
Probe Calibration	6.0	N	1	1	1	6.0	6.0	∞
Axial Isotropy	0.5	R	$\sqrt{3}$	0.7	0.7	0.2	0.2	∞
Hemispherical Isotropy	2.6	R	$\sqrt{3}$	0.7	0.7	1.1	1.1	∞
Boundary Effects	0.8	R	$\sqrt{3}$	1	1	0.5	0.5	∞
Linearity	0.6	R	$\sqrt{3}$	1	1	0.3	0.3	∞
System Detection Limits	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	∞
Readout Electronics	0.7	N	1	1	1	0.7	0.7	∞
Response Time	0	R	$\sqrt{3}$	1	1	0	0	∞
Integration Time	2.6	R	$\sqrt{3}$	1	1	1.5	1.5	∞
RF Ambient Noise	3.0	R	$\sqrt{3}$	1	1	1.7	1.7	∞
RF Ambient Reflections	3.0	R	$\sqrt{3}$	1	1	1.7	1.7	∞
Probe Positioner	1.5	R	$\sqrt{3}$	1	1	0.9	0.9	∞
Probe Positioning	2.9	R	$\sqrt{3}$	1	1	1.7	1.7	∞
Max. SAR Eval.	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	∞
Test Sample Related								
Device Positioning	2.9	N	1	1	1	2.9	2.9	145
Device Holder	3.6	N	1	1	1	3.6	3.6	5
Diople								
Power Drift	5.0	R	$\sqrt{3}$	1	1	2.9	2.9	∞
Dipole Positioning	2.0	N	1	1	1	2.0	2.0	∞
Dipole Input Power	5.0	N	1	1	1	5.0	5.0	∞
Phantom and Setup								
Phantom Uncertainty	4.0	R	$\sqrt{3}$	1	1	2.3	2.3	∞
Liquid Conductivity (target)	5.0	R	$\sqrt{3}$	0.64	0.43	1.8	1.2	∞
Liquid Conductivity (meas.)	2.5	N	1	0.64	0.43	1.6	1.1	∞
Liquid Permittivity (target)	5.0	R	$\sqrt{3}$	0.6	0.49	1.7	1.4	∞
Liquid Permittivity (meas.)	2.5	N	1	0.6	0.49	1.5	1.2	∞
Combined Std Uncertainty						±11.2%	±10.9%	387
Expanded Std Uncertainty						**±22.4 %**	**±21.8 %**	

17. Main Test Instrument

Table 17.1: List of Main Instruments

No.	Name	Type	Serial Number	Calibration Date	Valid Period
01	Network analyzer	N5242A	MY51221755	Jan 6, 2017	1 year
02	Power meter	NRVD	102257	May 12, 2016	1 year
03	Power sensor	NRV-Z5	100241		
			100644		
04	Signal Generator	E4438C	MY49072044	Jan 6, 2017	1 Year
05	Amplifier	NTWPA-0086010F	12023024	No Calibration Requested	
06	Coupler	778D	MY4825551	May 12, 2016	1 year
07	BTS	E5515C	MY50266468	Jan 18, 2016	1 year
08	E-field Probe	EX3DV4	7375	Dec 8, 2016	1 year
			3754	Jan 13, 2017	
09	DAE	SPEAG DAE3	360	Nov 8, 2016	1 year
		SPEAG DAE4	1244	Dec 12,2016	
10	Dipole Validation Kit	SPEAG D835V2	4d112	Oct 22, 2015	2 year
		SPEAG D1900V2	5d134	Nov 4,2015	2 year
		SPEAG D2450V2	858	Oct 30,2015	2 year

ANNEX A. GRAPH RESULTS

GSM 850MHz Left Cheek High

Date/Time: 2017/1/14
Electronics: DAE3 Sn360
Medium: Head 835MHz
Medium parameters used: f = 849 MHz; σ = 0.909 S/m; ε_r = 41.288; ρ = 1000 kg/m^3
Ambient Temperature:22 ℃ Liquid Temperature:22 ℃
Communication System: GSM Professional 835MHz; Frequency: 848.8 MHz; Duty Cycle: 1:8.3
Probe: EX3DV4 - SN7375ConvF(9.73, 9.73, 9.73); Calibrated: 12/8/2016
GSM 850MHz Left Cheek High/Area Scan (121x71x1):
Measurement grid: dx=10 mm, dy=10 mm
Maximum value of SAR (Measurement) = 0.387 W/kg
GSM 850MHz Left Cheek High/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 9.283 V/m; Power Drift = 0.08 dB
Peak SAR (extrapolated) = 0.465 W/kg
SAR(1 g) = 0.373 W/kg; SAR(10 g) = 0.283 W/kg
Maximum value of SAR (measured) = 0.393 W/kg

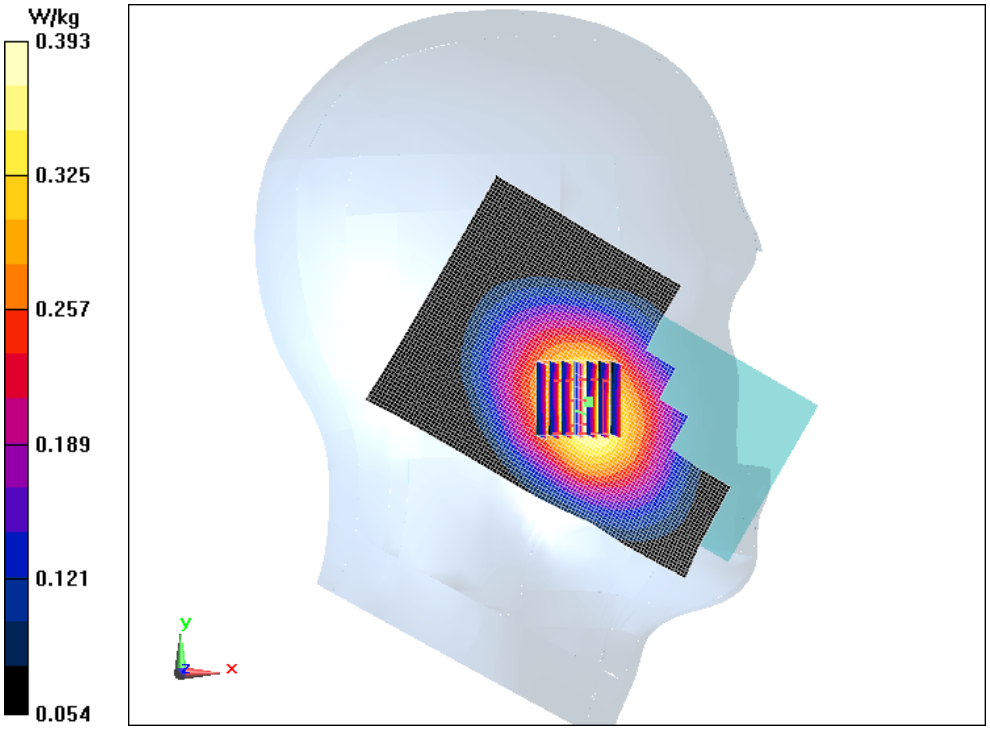


Fig.1 GSM 850MHz Left Cheek High

GSM 1900MHz Left Cheek Middle

Date/Time: 2017/1/15
Electronics: DAE3 Sn360
Medium: Head 1900MHz
Medium parameters used: f = 1880 MHz; σ = 1.409 S/m; ε_r = 40.167; ρ = 1000 kg/m^3
Ambient Temperature:22 ℃ Liquid Temperature:22 ℃
Communication System: GSM Professional 1900MHz; Frequency: 1880 MHz; Duty Cycle: 1:8.3
Probe: EX3DV4 - SN7375ConvF(7.92, 7.92, 7.92); Calibrated: 12/8/2016
GSM 1900MHz Left Cheek Middle/Area Scan (121x71x1):
Measurement grid: dx=10 mm, dy=10 mm
Maximum value of SAR (Measurement) = 0.209 W/kg
GSM 1900MHz Left Cheek Middle/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 5.308 V/m; Power Drift = 0.10 dB
Peak SAR (extrapolated) = 0.258 W/kg
SAR(1 g) = 0.172 W/kg; SAR(10 g) = 0.103 W/kg
Maximum of SAR (measured) = 0.184 W/kg

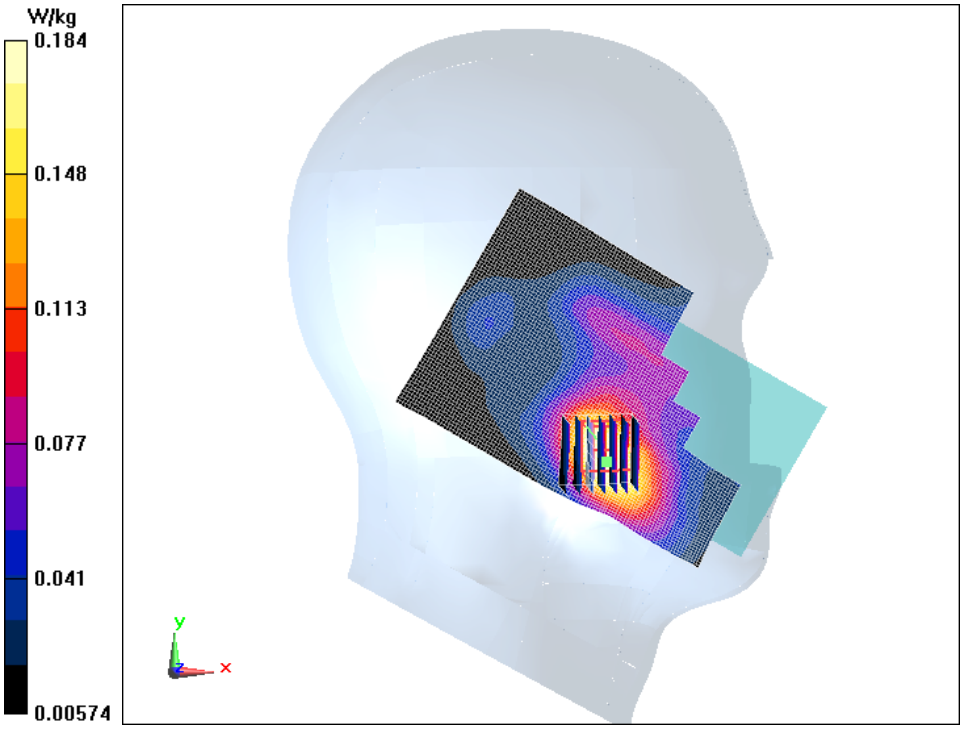


Fig.2 GSM 1900MHz Left Cheek Middle

WCDMA Band 2 Right Cheek Low

Date/Time: 2017/1/15
Electronics: DAE3 Sn360
Medium: Head 1900MHz
Medium parameters used (interpolated): f = 1852.4 MHz; σ = 1.403 S/m; ε_r = 40.446; ρ = 1000 kg/m^3
Ambient Temperature:22 ℃ Liquid Temperature:22 ℃
Communication System: WCDMA Professional Band Ⅱ; Frequency: 1852.4 MHz; Duty Cycle: 1:1
Probe: EX3DV4 - SN7375ConvF(7.92, 7.92, 7.92); Calibrated: 12/8/2016
WCDMA Band 2 Right Cheek Low/Area Scan (121x71x1):
Measurement grid: dx=10 mm, dy=10 mm
Maximum value of SAR (Measurement) = 0.259 W/kg
WCDMA Band 2 Right Cheek Low/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 5.610 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 0.338 W/kg
SAR(1 g) = 0.215 W/kg; SAR(10 g) = 0.134 W/kg
Maximum value of SAR (measured) = 0.231 W/kg

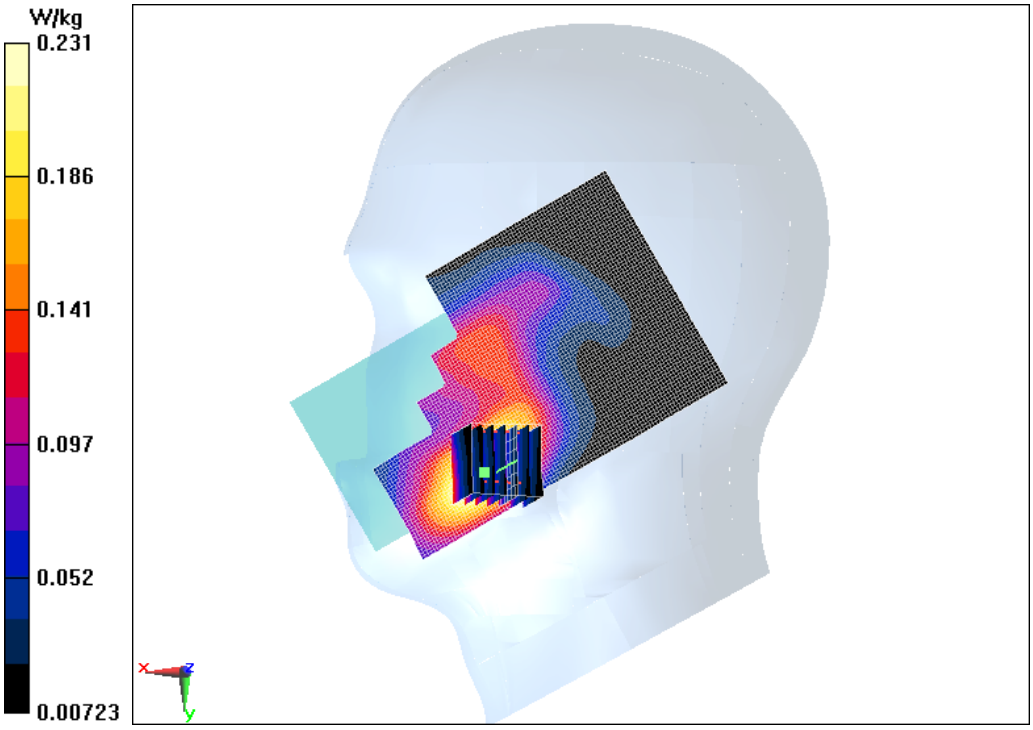


Fig.3 WCDMA Band 2 Right Cheek Low

WCDMA Band5 Right Cheek High

Date/Time: 2017/1/14
Electronics: DAE3 Sn360
Medium: Head 835MHz
Medium parameters used: f = 847 MHz; σ = 0.925 S/m; ε_r = 41.309; ρ = 1000 kg/m^3
Ambient Temperature:22 ℃ Liquid Temperature:22 ℃
Communication System: WCDMA Professional 835MHz; Frequency: 846.6 MHz; Duty Cycle: 1:1
Probe: EX3DV4 - SN7375ConvF(9.73, 9.73, 9.73); Calibrated: 12/8/2016
WCDMA Band5 Right Cheek High/Area Scan (121x71x1):
Measurement grid: dx=10 mm, dy=10 mm
Maximum value of SAR (Measurement) = 0.348 W/kg
WCDMA Band5 Right Cheek High/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 6.936 V/m; Power Drift = 0.11 dB
Peak SAR (extrapolated) = 0.326 W/kg
SAR(1 g) = 0.262 W/kg; SAR(10 g) = 0.198 W/kg
Maximum value of SAR (measured) = 0.278 W/kg

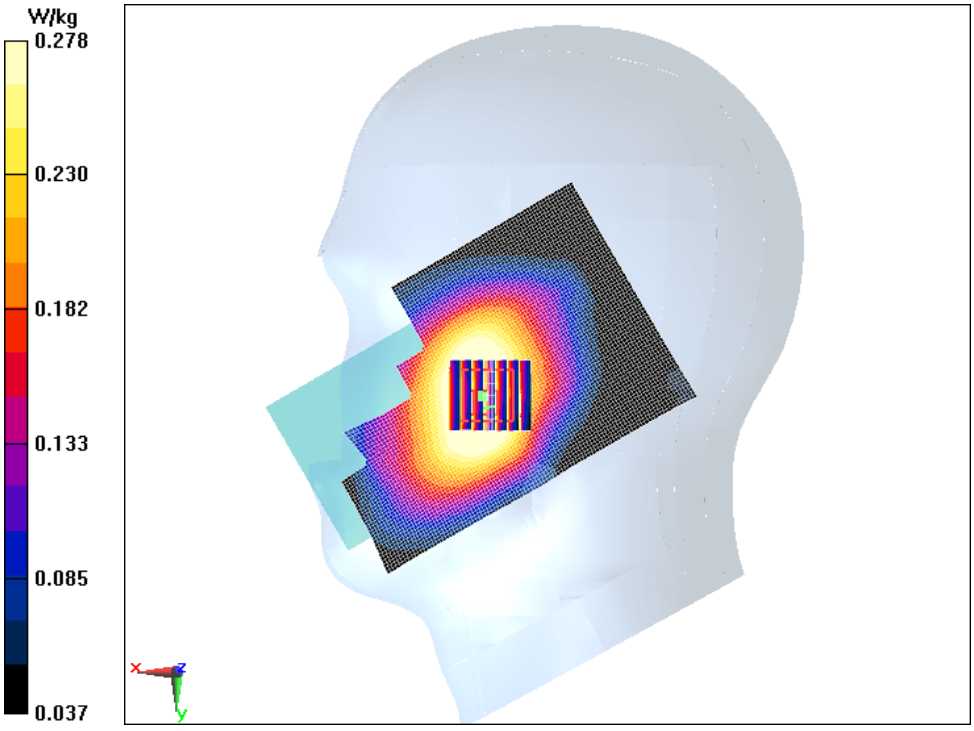


Fig.4 WCDMA Band5 Right Cheek High