TEST REPORT

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1. Client

◦ Name : Samsung Electronics Co., Ltd.

◦ Address : 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea

◦ Date of Receipt : 2020-08-11

2. Use of Report : Class II Permissive change

3. Name of Product and Model : Mobile phone

◦ Model Number : SM-A013M

◦ Manufacturer and Country of Origin : Samsung Electronics Co., Ltd. / VIETNAM

4. FCC ID : A3LSMA013M

5. Date of Test : 2020-08-12

6. Location of Test : ■ Permanent Testing Lab □ On Site Testing (Address: Address of testing location)

7. Test Standards : IEEE 1528-2013, ANSI/IEEE C95.1, KDB Publication

8. Test Results : Refer to the test result in the test report

Affirmation	Tested by Name : Dongkyu Kim (Signature)	Technical Manager Name : Gyuhyun Shim (Signature)

2020-08-14

KCTL Inc.

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REPORT REVISION HISTORY

Date	Revision	Page No
2020-08-13	Originally issued	-
2020-08-14	-Updated Output Power Section 2.2 Summary of SAR Test Results Section 8. Conducted Output Power Section 10. SAR Test Results	 6 22 ~ 23 27 ~ 28

Note: The Report No. KR20-SPF0034 is superseded by the report No. KR20-SPF0034-A

General remarks for test reports

1. Identification when information is provided by the customer: Information marked "#" is provided by the customer.
- Disclaimer: This information is provided by the customer and can affect the validity of results.

CONTENTS

1. General information

Client	:	Samsung Electronics Co., Ltd.
Address	:	129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea
Manufacturer	:	Samsung Electronics Vietnam Co. Ltd.
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		VCCI Registration No. : R-3327, G-198, C-3706, T-1849
		Industry Canada Registration No. : 8035A
		KOLAS No.: KT231

1.1 Report Overview

This report details the results of testing carried out on the samples listed in section 2, 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.

This report may only be reproduced and distributed in full. If the product in this test report is used in any configuration other than that detailed in the test report, the manufacturer must ensure the new configuration complies with all relevant standards and certification requirements. Any mention of KCTL Inc. Wireless lab or testing done by KCTL Inc. Wireless lab made in connection with the distribution or use of the tested product must be approved in writing by KCTL Inc. Wireless lab.

2. Device information

2.1 Basic description

Product Name		Mobile phone		
Product Model Number		SM-A013M		
Derivative Model		-		
Product Manufacturer		Samsung Electronics Co., Ltd.		
Product Serial Number	Radiation	R38N60177CF		
		R38N502CV2J		
	Conduction	R38N60176QT		
Device Overview		Band & Mode	Operating Modes	Tx Frequency (㎒)
		GSM/GPRS/EDGE 850	Voice/Data	824.2 ~ 848.8
		GSM/GPRS/EDGE 1900	Voice/Data	1 850.2 ~ 1 909.8
		WCDMA II	Voice/Data	1 852.4 ~ 1 907.6
		WCDMA IV	Voice/Data	1 712.4 ~ 1 752.6
		WCDMA V	Voice/Data	826.4 ~ 846.6
		LTE Band 2	Voice/Data	1 850.7 ~ 1 909.3
		LTE Band 4	Voice/Data	1 710.7 ~ 1 754.3
		LTE Band 5	Voice/Data	824.7 ~ 848.3
		LTE Band 66	Voice/Data	1 710.7 ~ 1 779.3
		WLAN 2.4 ㎓	Voice/Data	2 412.0 ~ 2 472.0
		Bluetooth	Data	2 402.0 ~ 2 480.0

Note: This Report is for verification of derivative model SM-A013M.

The derivative model SM-A013M is all parts and hardware are same, only SIM Tray is different.
- Basic Model: SM-A013M/DS (It supports Dual SIM)
- Derivative Model: SM-A013M (It supports Single SIM)

We confirmed that Verification was done and model SM-A013M/DS was determined as the worst case to cover SM-A013M for final test.

Please Refer to the basic model(SM-A013M/DS) report for other details.

2.2 Summary of SAR Test Results

Band	Equipment Class	Highest Reported 1g SAR (W/kg)		
		Head	Body-Worn	Hotspot
GSM/GPRS/EDGE 850	PCE	N/A	**0.73**	**1.04**
2.4 ㎓ WLAN	DTS	**0.82**	N/A	N/A

Note: SAR Test was performed in the worst configuration by each exposure of the Basic model(SM-A013M/DS)

2.3 Power Reduction for SAR

This device uses an independent fixed level power reduction mechanism for WLAN Mode operations during voice or VoWiFi held to ear scenarios. Per FCC Guidance, the held-to-ear exposure conditions were evaluated at reduced power according to the Head SAR positions described in IEEE 1528-2013. Detailed descriptions of the power reduction mechanism are included in the operational description.

2.4 #Maximum Tune-up power

This device operates using the following maximum output power specifications. SAR values were scaled to the maximum allowed power to determine compliance per KDB Publication 447498 D01v06.

2.4.1 Maximum 2G/3G/4G Output Power

Band	Mode	Output Power (dBm)		
		Target	Max. Allowed	SAR Test
GSM 850	GSM Voice	33.00	**34.00**	No
	GPRS 1 TX	33.00	**34.00**	No
	GPRS 2 TX	31.00	**32.00**	No
	GPRS 3 TX	30.00	**31.00**	No
	GPRS 4 TX	29.00	**30.00**	**Yes**
	EGPRS 1 TX	27.00	**28.00**	No
	EGPRS 2 TX	25.00	**26.00**	No
	EGPRS 3 TX	24.00	**25.00**	No
	EGPRS 4 TX	22.00	**23.00**	No

2.4.2 Maximum WLAN and Bluetooth Output Power

Band	Mode	Channel	Output Power (dB m)		
			Target	Max. Allowed	SAR Test
WLAN 2.4 GHz	802.11b	12,13	14.00	**15.00**	No
		Except 12,13	18.00	**19.00**	
	802.11g	1, 11	13.00	**14.00**	No
		2 ~ 10	16.00	**17.00**	
		12,13	9.00	**10.00**	
	802.11n(HT20)	1, 11	13.00	**14.00**	No
		2 ~ 10	16.00	**17.00**	
		12,13	9.00	**10.00**	

2.4.3 Reduced WLAN Output Power-RCV

Band	Mode	Channel	Output Power (dB m)		
			Target	Max. Allowed	SAR Test
WLAN 2.4 GHz (RCV)	802.11b	12,13	13.00	**14.00**	**Yes**
		Except 12,13	15.00	**16.00**	
	802.11g	1, 11	12.00	**13.00**	No
		2 ~ 10	15.00	**16.00**	
		12,13	8.00	**9.00**	
	802.11n(HT20)	1, 11	12.00	**13.00**	No
		2 ~ 10	15.00	**16.00**	
		12,13	8.00	**9.00**	

2.5 SAR Test Methods and Procedures

The tests documented in this report were performed in accordance with IEEE 1528-2013 and the following published KDB procedures:

- IEEE 1528-2013
- 248227 D01 802.11 Wi-Fi SAR v02r02
- 447498 D01 General RF Exposure Guidance v06
- 648474 D04 Handset SAR v01r03
- 865664 D01 SAR measurement 100 ㎒ to 6 ㎓ v01r04
- 865664 D02 RF Exposure Reporting v01r02
- 941225 D06 Hotspot Mode v02r01
- October 2014 TCB Workshop Notes (Other LTE Considerations)
- October 2016 TCB Workshop Notes (Bluetooth Duty Factor)
- April 2019 TCB Workshop Notes (Tissue Simulation Liquids)

3. Specific Absorption Rate

3.1 Introduction

The 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.

3.2 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:

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

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

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

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 the tissue and E is the RMS electrical field strength. However for evaluating SAR of low power transmitter, electrical field measurement is typically applied.

4. SAR Measurement Procedures

4.1 SAR Scan Procedures

Step 1: Power Reference Measurement

The Power Reference Measurement and Power Drift Measurements are for monitoring the power drift of the device under test in the batch process. The Minimum distance of probe sensors to surface determines the closest measurement point to phantom surface. The minimum distance of probe sensors to surface is 1.4 mm. This distance cannot be smaller than the Distance of sensor calibration points to probe tip as defined in the probe properties.

Step 2: Area Scan & Zoom Scan

The Area Scan is used as a fast scan in two dimensions to find the area of high field values, before doing a fine measurement around the hot spot and Zoom Scans are used to assess the peak spatial SAR values within a cubic averaging volume containing1 g and 10 g of simulated tissue. If only one Zoom Scan follows the Area Scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of Zoom Scans has to be increased accordingly. Area Scan & Zoom Scan Parameters extracted from KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04.

			≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface			5 mm ± 1 mm	½·δ·ln(2) mm 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·$\Delta z_{Zoom}(n-1)$ mm	
Minimum zoom scan volume	x, y, z		≥ 30 mm	3 – 4 GHz: ≥ 28 mm 4 – 5 GHz: ≥ 25 mm 5 – 6 GHz: ≥ 22 mm
Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see IEEE Std 1528-2013 for details. * When zoom scan is required and the reported SAR from the area scan based 1-g SAR estimation procedures of KDB Publication 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.				

Step 3: Power drift measurement

The Power Drift Measurement measures the field at the same location as the most recent power reference measurement within the same procedure, and with the same settings. The Power Drift Measurement gives the field difference in dB from the reading conducted within the last Power Reference Measurement. This allows a user to monitor the power drift of the device under test within a batch process. The measurement procedure is the same as Step 1.

5. SAR Measurement Configurations

5.1 Ear Reference Point

Figure 1shows the front, back and side views of the SAM phantom. The “M” is the reference point for the center of the mouth, “LE” is the left ear reference point (ERP), and “RE” is the right ERP. The ERPs are 15 mm posterior to the entrance to the Ear canal (EEC) along the B-M line (Back-Mouth), as shown in Figure 1. The plane Passing, through the two ear canals and M is defined as the Reference Plane. The line N-F (Neck – Front) is perpendicular to the reference plane and passing through the LE (or RE) is called the Reference Pivoting Line. Both N-F and B-M lines are marked on the external phantom shell to facilitate handset positioning.

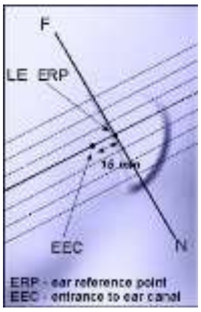


Figure 1
Close-Up Side view of ERP

5.2 Handset Reference Points

Two imaginary lines on the handset were established: the vertical centerline and the horizontal line. The test device was placed in a normal operating position with the acoustic output located along the “vertical centerline” on the front of the device aligned to the “ear reference point” (See Figure 3). The acoustic output was than located at the same level as the center of the ear reference point. The test device was positioned so that the “vertical centerline” was bisecting the front surface of the handset at its top and bottom edges, positioning the “ear reference point” on the outer surface of the both the left and right head phantoms on the ear reference point.

Figure 2
Front, back and side view of SAM Twin Phantom

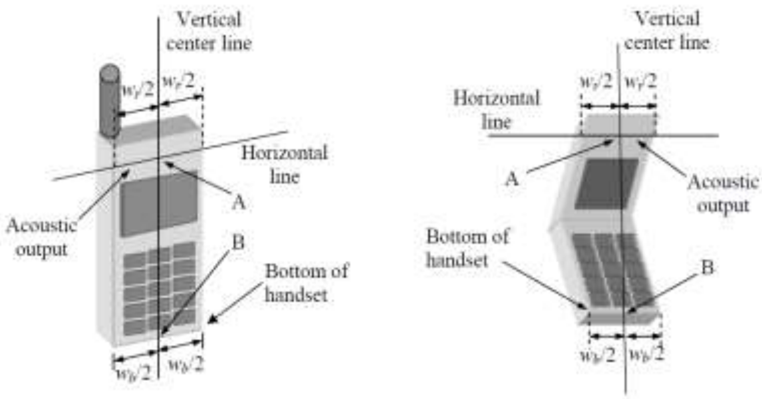


Figure 3
Handset Vertical Center & Horizontal Line Reference Points

5.3 Device Holder

The device holder is made out of low-loss POM material having the following dielectric parameters: relative permittivity ε = 3 and loss tangent δ = 0.02.

5.4 Positioning for Cheek/Touch

1. The test device was positioned with the device close to the surface of the phantom such that point A is on the (virtual) extension of the line passing through points RE and LE on the phantom (see Figure 4), such that the plane defined by the vertical center line and the horizontal line of the phone is approximately parallel to the sagittal plane of the phantom.

Figure 4: Front, Side and Top View of Cheek Position

2. The handset was translated towards the phantom along the line passing through RE & LE until the handset touches the pinna.
3. While maintaining the handset in this plane, the handset was rotated around the LE-RE line until the vertical centerline was in the reference plane.
4. The phone was then rotated around the vertical centerline until the phone (horizontal line) was symmetrical was respect to the line NF.
5. While maintaining the vertical centerline in the reference plane, keeping point A on the line passing through RE and LE, and maintaining the device contact with the ear, the device was rotated about the NF line until any point on the handset made contact with a phantom point below the ear (cheek) (See Figure 5).

5.5 Positioning for Ear / 15˚ Tilt

With the test device aligned in the “Cheek Position”:

1. While maintaining the orientation of the phone, the phone was retracted parallel to the reference plane far enough to enable a rotation of the phone by 15 degrees.
2. The phone was then rotated around the horizontal line by 15 degrees.
3. While maintaining the orientation of the phone, the phone was moved parallel to the reference plane until any part of the handset touched the head. (In this position, point A was located on the line RE-LE). The tilted position is obtained when the contact is on the pinna. If the contact was at any location other than the pinna, the angle of the phone would then be reduced. In this situation, the tilted position was obtained when any part of the phone was in contact of the ear as well as a second part of the phone was in contact with the head (see Figure 5).

Figure 5: Front, Side and Top View of Ear/ 15˚ Tilt

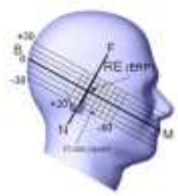


Figure 6: Side view w/ relevant markings

5.6 Body-Worn Accessory Configurations

Figure 7
Sample Body-Worn Diagram

Body-worn operating configurations are tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in a normal use configuration (see Figure 7). Per FCC KDB Publication 648474 D04v01r03, Body-worn accessory exposure is typically related to voice mode operations when handsets are carried in body-worn accessories. The body-worn accessory procedures in FCC KDB Publication 447498 D01v06 should be used to test for body-worn accessory SAR compliance, without a headset connected to it. This enables the test results for such configuration to be compatible with that required for hotspot mode when the body-worn accessory test separation distance is greater than or equal to that required for hotspot mode, when applicable. When the reported SAR for a body-worn accessory, measured without a headset connected to the handset, is > 1.2 W/kg, the highest reported SAR configuration for that wireless mode and frequency band should be repeated for that body-worn accessory with a headset attached to the handset.

Accessories for Body-worn operation configurations are divided into two categories: those that do not contain metallic components and those that do contain metallic components. When multiple accessories that do not contain metallic components are supplied with the device, the device is tested with only the accessory that dictates the closest spacing to the body. Then multiple accessories that contain metallic components are tested with the device with each accessory. If multiple accessories share an identical metallic component (i.e. the same metallic belt-clip used with different holsters with no other metallic components) only the accessory that dictates the closest spacing to the body is tested.
Body-worn accessories may not always be supplied or available as options for some devices intended to be authorized for body-worn use. In this case, a test configuration with a separation distance between the back of the device and the flat phantom is used. Test position spacing was documented. Transmitters that are designed to operate in front of a person's face, as in push-to-talk configurations, are tested for SAR compliance with the front of the device positioned to face the flat phantom in head fluid. For devices that are carried next to the body such as a shoulder, waist or chest-worn transmitters, SAR compliance is tested with the accessories, including headsets and microphones, attached to the device and positioned against a flat phantom in a normal use configuration.

5.7 Wireless Router Configurations

Some battery-operated handsets have the capability to transmit and receive user data through simultaneous transmission of WIFI simultaneously with a separate licensed transmitter. The FCC has provided guidance in FCC KDB Publication 941225 D06v02r01 where SAR test considerations for handsets (L x W ≥ 9 cm x 5 cm) are based on a composite test separation distance of 10 mm from the front, back and edges of the device containing transmitting antennas within 2.5 cm of their edges, determined from general mixed use conditions for this type of devices. Since the hotspot SAR results may overlap with the body-worn accessory SAR requirements, the more conservative configurations can be considered, thus excluding some body-worn accessory SAR tests.

When the user enables the personal wireless router functions for the handset, actual operations include simultaneous transmission of both the WIFI transmitter and another licensed transmitter. Both transmitters often do not transmit at the same transmitting frequency and thus cannot be evaluated for SAR under actual use conditions due to the limitations of the SAR assessment probes. Therefore, SAR must be evaluated for each frequency transmission and mode separately and spatially summed with the WIFI transmitter according to FCC KDB Publication 447498 D01v06 procedures. The "Portable Hotspot" feature on the handset was NOT activated during SAR assessments, to ensure the SAR measurements were evaluated for a single transmission frequency RF signal at a time.

5.8 Phablet Configurations

For smart phones with a display diagonal dimension > 150 mm or an overall diagonal dimension > 160 mm that provide similar mobile web access and multimedia support found in mini-tablets or UMPC mini-tablets that support voice calls next to the ear, the phablets procedures outlined in KDB Publication 648474 D04v01r03 should be applied to evaluate SAR compliance. A device marketed as phablets, regardless of form factors and operating characteristics must be tested as a phablet to determine SAR compliance. In addition to the normally required head and body-worn accessory SAR test procedures required for handsets, the UMPC mini-tablet procedures must also be applied to test the SAR of all surfaces and edges with an antenna <=25 mm from that surface or edge, in direct contact with the phantom, for 10g SAR. The UMPC mini-tablet 1g SAR at 5 mm is not required. When hotspot mode applies, 10g SAR is required only for the surfaces and edges with hotspot mode 1g SAR > 1.2 W/kg.

6. RF Exposure Limits

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

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

Human Exposure	Uncontrolled Environment General Population	Controlled Environment Occupational
Partial Peak SAR 1) (Partial)	1.60 mW/g	8.00 mW/g
Partial Average SAR 2) (Whole Body)	0.08 mW/g	0.40 mW/g
Partial Peak SAR 3) (Hands/Feet/Ankle/Wrist)	4.00 mW/g	20.00 mW/g

1) The spatial Peak value of the SAR averaged over any 1g gram of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.
2) The spatial Average value of the SAR averaged over the whole body.
3) 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.

7. FCC SAR General Measurement Procedures

7.1 Measured and Reported SAR

Per FCC KDB Publication 447498 D01v06, When SAR is not measured at the maximum power level allowed for production units, the results must be scaled to the maximum tune-up tolerance limit according to the power applied to the individual channels tested to determine compliance. For simultaneous transmission, the measured aggregate SAR must be scaled according to the sum of the differences between the maximum tune-up tolerance and actual power used to test each transmitter. When SAR is measured at or scaled to the maximum tune-up tolerance limit, the results are referred to as reported SAR. Test highest reported SAR results are identified on the grant of equipment authorization according to procedures in KDB 690783 D01v01r03.

7.2 3G SAR Test Reduction Procedure

In FCC KDB Publication 941225 D01v03r01, certain transmission modes within a frequency band and wireless mode evaluated for SAR are defined as primary modes. The equivalent modes considered for SAR test reduction are denoted as secondary modes. When the maximum output power including tune-up tolerance specified for production units in a secondary mode is ≤ 0.25 dB higher than the primary mode or when the highest reported SAR of the primary mode, scaled by the ratio of specified maximum output power and tune-up tolerance of secondary to primary mode, is ≤ 1.2 W/kg, SAR measurements are not required for the secondary mode. These criteria are referred to as the 3G SAR test reduction procedure. When the 3G SAR test reduction procedure is not satisfied, SAR measurements are additionally required for the secondary mode.

7.3 Procedures Used to Establish RF Signal for SAR

The following procedures are according to FCC KDB Publication 941225 D01v03r01 “3G SAR Measurement Procedures.”
The device is placed into a simulated call using a base station simulator in a RF shielded chamber. Establishing connections in this manner ensure a consistent means for testing SAR and are recommended for evaluating SAR [4]. Devices under test are evaluated prior to testing, with a fully charged battery and were configured to operate at maximum output power. In order to verify that the device is tested throughout the SAR test at maximum output power, the SAR measurement system measures a “point SAR” at an arbitrary reference point at the start and end of the 1 gram SAR evaluation, to assess for any power drifts during the evaluation. If the power drift deviates by more than 5%, the SAR test and drift measurements are repeated.

7.4 SAR Measurement Conditions for UMTS

7.4.1 Output Power Verification

Maximum output power is verified on the High, Middle and Low channels according to the general descriptions in sec. 5.2 of 3GPP TS 34.121, using the appropriate RMC with TPC (transmit power control) set to all “1s” or applying the required inner loop power control procedures to maintain maximum output power while HSUPA is active. Results for all applicable physical channel configurations (DPCCH, DPDCHn and spreading codes, HS-DPCCH etc) are tabulated in this test report. All configurations that are not supported by the DUT or cannot be measured due to technical or equipment limitations are identified.

7.4.2 Head SAR Measurements

SAR for next to the ear head exposure is measured using a 12.2 kbps RMC with TPC bits configured to all “1’s”. The 3G SAR test reduction procedure is applied to AMR configurations with 12.2 kbps RMC as the primary mode. Otherwise, SAR is measured for 12.2 kbps AMR in 3.4 kbps SRB (signaling radio bearer) using the highest reported SAR configuration in 12.2 kbps RMC for head exposure.

7.4.3 Body SAR measurements

SAR for body exposure configurations is measured using the 12.2kbps RMC with the TPC bits all “1s”. the 3G SAR test reduction procedure is applied to other spreading codes and multiple DPDCHn configurations supported by the handset with 12.2 kbps RMC as the primary mode. Otherwise, SAR is measured using and applicable RMC configuration with the corresponding spreading code or DPDCHn, for the highest reported SAR configuration in 12.2kbps RMC.

7.4.4 SAR Measurements with Rel. 5 HSDPA

The 3G SAR test reduction procedure is applied to HSDPA body configurations with 12.2 kbps RMC as the primary mode. Otherwise, Body SAR for HSDPA is measured using and FRC with H-SET 1 in Sub-test and a 12.2 kbps RMC without HSDPA. Handsets with both HSDPA and HSUPA are tested according to release 6 HSPA test procedures. 8.4.5 SAR Measurement with Rel.6 HSUPA The 3G SAR test Reduction Procedure is applied to HSPA (HSUPA/HSDPA with RMC) body configurations with 12.2 kbps RMC as the primary mode. Otherwise, Body SAR for HSPA is measured with E-DCH Sub-test 5, Using H-Set 1 and QPSK for FRC and a 12.2kbps RMC configured in Test Loop Mode 1 and Power Control algorithm 2, according to the highest reported body SAR configuration in 12.2 kbps RMC without HSPA. When VOIP applies to head exposure, the 3G SAR test reduction procedure is applied with 12.2 kbps RMC as the primary mode; otherwise, the same HSPA configuration used for body SAR measurements are applied to head exposure testing.

7.4.5 SAR Measurements with Rel. 6 HSUPA

The 3G SAR test reduction procedure is applied to HSPA (HSUPA/HSDPA with RMC) body configurations with 12.2 kbps RMC as the primary mode. Otherwise, Body SAR for HSPA is measured with E-DCH Sub-test 5, using H-Set1 and QPSK for FRC and a 12.2 kbps RMC configured in Test Loop Mode 1 and power control algorithm 2, according to the highest reported body SAR configuration in 12.2 kbps RMC without HSPA.

7.4.6 SAR Measurements with Rel. 8 DC-HSDPA

SAR is required for Rel. 8 DC-HSDPA when SAR is required for Rel. 5 HSDPA; otherwise, the 3G SAR test reduction procedure is applied to DC-HSDPA with 12.2 kbps RMC as the primary mode. Power is measured for DC-HSDPA according to the H-Set 12, FRC configuration in Table C.8.1.12 of 3GPP TS 34.121-1 to determine SAR test reduction. A primary and a secondary serving HS-DSCH Cell are required to perform the power measurement and for the results to be acceptable

7.5 SAR Measurement Conditions for LTE

LTE modes are tested according to FCC KDB 941225 D05v02r05 publication. Establishing connections with base station simulators ensure a consistent means for testing SAR and are recommended for evaluation SAR [4]. The R&S CMW500 or Anritsu MT8820C simulators are used for LTE output power measurements and SAR testing. Closed loop power control was used so the UE transmits with maximum output power during SAR testing. SAR tests were performed with the same number of RB and RB offsets transmitting on all TTI frames (maximum TTI).

7.5.1 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.

7.5.2 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.

7.5.3 A-MPR

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

7.5.4 Required RB Size and RB offsets for SAR testing

According to FCC KDB 941225 D05v02r05

1. Per sec 4.2.1, SAR is required for QPSK 1 RB Allocation for the largest bandwidth
   a. The required channel and offset combination with the highest maximum output power is required for SAR.
   b. When the reported SAR is ≤ 0.8 W/Kg, testing of the remaining RB offset configurations and required test channels is not required. Otherwise, SAR is required for the remaining required test channels using the RB offset configuration with highest output power for that channel.
   c. When the reported SAR for a required test channel is > 1.45 W/kg, SAR is required for all RB offset configurations for that channel
2. Per Sec 4.2.2, SAR is required for 50% RB allocation using the largest bandwidth following the same procedures outlined in Sec 4.2.1.
3. Per Sec. 4.2.3, QPSK SAR is not required for the 100% all0cation when the highest maximum output power for the 100% allocation is less than the highest maximum output power of the 1 RB and 50% RB allocations and the reported SAR for the 1 RB and 50% RB allocations is < 0.8 W/kg.
4. Per Sec. 4.2.4 and 4.3, SAR test for higher order modulations and lower bandwidths configurations are not required when the conducted power of the required test configurations determined by Sec. 4.2.1 through 4.2.3 is less than or equal to 1/2 dB higher than the equivalent configuration using QPSK modulation and when the QPSK SAR for those configurations is < 1.45 W/Kg.

7.6 SAR Testing with 802.11 Transmitters

The normal network operating configurations are not suitable for measuring the SAR of 802.11 a/b/g transmitters. 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 the results are consistent and reliable.

7.6.1 General Device Setup

Chipset based test mode software is hardware dependent and generally varies among manufacturers. The device operating parameters established in 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. A periodic duty factor is required for current generation SAR systems to measure SAR. When 802.11 frame gaps are accounted for in the transmission, a maximum transmission duty factor of 92 – 96% is typically achievable in most test mode configurations. A minimum transmission duty factor of 85% is required to avoid certain hardware and device implementation issues related to wide range SAR scaling. The reported SAR is scaled to 100% transmission duty factor to determine compliance at the maximum tune-up tolerance limit.

7.6.2 Initial Test Position Procedure

For exposure conditions with multiple test positions, such as handset operating next to the ear, devices with hotspot mode or UMPC mini-tablet, procedures for initial test position can be applied. Using the transmission mode determined by the DSSS procedure or initial test configuration, area scans are measured for all positions in an exposure condition. The test position with the highest extrapolated (peak) SAR is used as the initial test position. When reported SAR for the initial test position is ≤ 0.4 W/kg, no additional testing for the remaining test positions is required. Otherwise, SAR is evaluated at the subsequent highest peak SAR positions until the reported SAR result is ≤ 0.8 W/kg or all test positions are measured.

7.6.3 2.4 ㎓ SAR Test Requirement

SAR is measured for 2.4 ㎓ 802.11b DSSS using either the fixed test position or, when applicable, the initial test position procedure. SAR test reduction is determined according to the following.

1) When the reported SAR of the highest measured maximum output power channel for the exposure configuration is ≤ 0.8 W/kg, no further SAR testing is required for 802.11b DSSS in that exposure configuration.
2) When the reported SAR is > 0.8 W/kg, SAR is required for that position using the next highest measured output power channel; i.e., all channels require testing.

2.4 ㎓ 802.11g/n OFDM are additionally evaluated for SAR if highest reported SAR for 802.11b, adjusted by the ratio of the OFDM to DSSS specified maximum output power, is > 1.2 W/kg. When SAR is required for OFDM modes in 2.4 ㎓ band, the Initial Test Configuration Procedures should be followed.

7.6.4 OFDM Transmission Mode and SAR Test Channel Selection

For the 2.4 ㎓ and 5 ㎓ band, when the same maximum output power was specified for multiple OFDM transmission mode configurations in a frequency band or aggregated band, SAR is measured using the configuration with the largest channel bandwidth, lowest order modulation and lowest data rate. When the maximum output power of a channel is the same for equivalent OFDM configurations; for example, 802.11a, 802.11n and 802.11ac or 802.11g and 802.11n with the same channel band width, modulation and data rate etc., the lower order 802.11 mode i.e., 802.11a, then 802.11n and 802.11ac or 802.11g then 802.11n, is used for SAR measurement. When maximum output power are the same for multiple test channels, either according to the default or additional power measurement requirements, SAR is measured using the channel closest to the middle of the frequency band or aggregated band. When there are multiple channels with the same maximum output power, SAR is measured using the higher number channel.

7.6.5 Initial Test Configuration Procedure

For OFDM, in both 2.4 and 5 ㎓ bands, an initial test configuration is determined for each frequency band and aggregated band, according to the transmission mode with the highest maximum output power specified for SAR measurements. When the same maximum output power is specified for multiple OFDM transmission mode configurations in a frequency band or aggregated band, SAR is measured using the configuration(s) with the largest channel bandwidth, lowest order modulation, and lowest data rate. If the average RF output powers of the highest identical transmission modes are within 0.25 ㏈ of each other, mid channel of the transmission mode with highest average RF output power is the initial test channel. Otherwise, the channel of the transmission mode with the highest average RF output conducted power will be the initial test configuration.

When the reported SAR is ≤ 0.8 W/kg, no additional measurements on other test channels are required. Otherwise, SAR is evaluated using the subsequent highest average RF output channel until the reported SAR result is ≤ 1.2 W/kg or all channels are measured. When there are multiple untested channels having the same subsequent highest average RF output power, the channel with higher frequency from the lowest 802.11 mode is considered for SAR measurements.

7.6.6 Subsequent Test Configuration Procedures

For OFDM configurations in each frequency band and aggregated band, SAR is evaluated for initial test configuration using the fixed test position or the initial test position procedure. When the highest reported SAR (for the initial test configuration), adjusted by the ratio of the specified maximum output power of the subsequent test configuration to initial test configuration, is ≤ 1.2 W/kg, no additional SAR tests for the subsequent test configurations are required. When 10g SAR measurement is considered, a factor of 2.5 is applied to the thresholds above.

8. RF Average Conducted Output Power

8.1 GSM Average Conducted Output Power (Maximum Average Power)

Maximum Burst-Average Output Power (dB m)										
Band	Channel	GSM	GPRS (GMSK)				EGPRS (8-PSK)			
		Voice	1Tx	2Tx	3Tx	4Tx	1Tx	2Tx	3Tx	4Tx
GSM 850	128	32.79	32.81	31.49	30.10	29.15	26.73	25.72	23.73	22.68
	190	33.56	33.58	31.93	30.75	29.55	27.62	25.98	24.65	22.87
	251	33.35	33.37	31.94	30.72	29.58	27.41	25.99	24.47	22.91

Maximum Frame-Average Output Power (dB m)										
Band	Channel	GSM	GPRS (GMSK)				EGPRS (8-PSK)			
		Voice	1Tx	2Tx	3Tx	4Tx	1Tx	2Tx	3Tx	4Tx
GSM 850	128	23.76	23.78	25.47	25.84	26.14	17.70	19.70	19.47	19.67
	190	24.53	24.55	25.91	26.49	26.54	18.59	19.96	20.39	19.86
	251	24.32	24.34	25.92	26.46	26.57	18.38	19.97	20.21	19.90
GSM 850	Frame Avg, Target	24.97	24.97	25.98	26.74	**26.99**	18.97	19.98	20.74	19.99

8.2 WLAN Average Conducted Output Power (Maximum Average Power)

Band	Freq. [MHz]	Channel	Mode		
			802.11b	802.11g	802.11n
WLAN 2.4 GHz	2 412.0	1	18.71	12.97	13.62
	2 437.0	6	18.22	16.17	16.20
	2 462.0	11	18.33	13.84	13.80
	2 467.0	12	14.41	9.84	9.71
	2 472.0	13	14.40	9.65	9.82

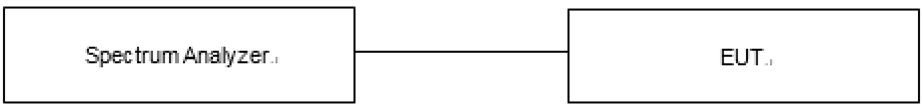
8.3 WLAN Average Conducted Output Power (Reduced Average Power)

Band	Freq. [MHz]	Channel	Mode		
			802.11b	802.11g	802.11n
WLAN 2.4 GHz	2 412.0	1	15.66	12.14	12.24
	2 437.0	6	15.41	15.21	15.23
	2 462.0	11	15.71	12.78	12.76
	2 467.0	12	13.58	8.75	8.86
	2 472.0	13	13.44	8.61	8.68

Justification for test configurations for WLAN per KDB Publication 248227 D01v02r02:

- Power measurements were performed for the transmission mode configuration with the highest maximum output power specified for production units.
- For transmission modes with the same maximum output power specification, powers were measured for the largest channel bandwidth, lowest order modulation and lowest data rate.
- For transmission modes with identical maximum specified output power, channel bandwidth, modulation and data rates, power measurements were required for all identical configurations.
- For each transmission mode configuration, powers were measured for the highest and lowest channels; and at the mid-band channel(s) when there were at least 3 channels supported. For configurations with multiple mid-band channels, due to an even number of channels, both channels were measured.

Power Measurement Setup



8.4 Wireless Band Duty Cycle

Wireless Bands	Frequency Bands	Mode	Duty Cycle (%)
GSM	850	Voice, GPRS(GMSK), EGPRS(8PSK)	Voice: 12.5
			(E)GPRS 1Tx : 12.5
			(E)GPRS 2Tx : 25.0
			(E)GPRS 3Tx : 37.5
			(E)GPRS 4Tx : 50.0
WLAN	2.4 ㎓	802.11b	99.30

9. System Verification

9.1 Tissue Verification

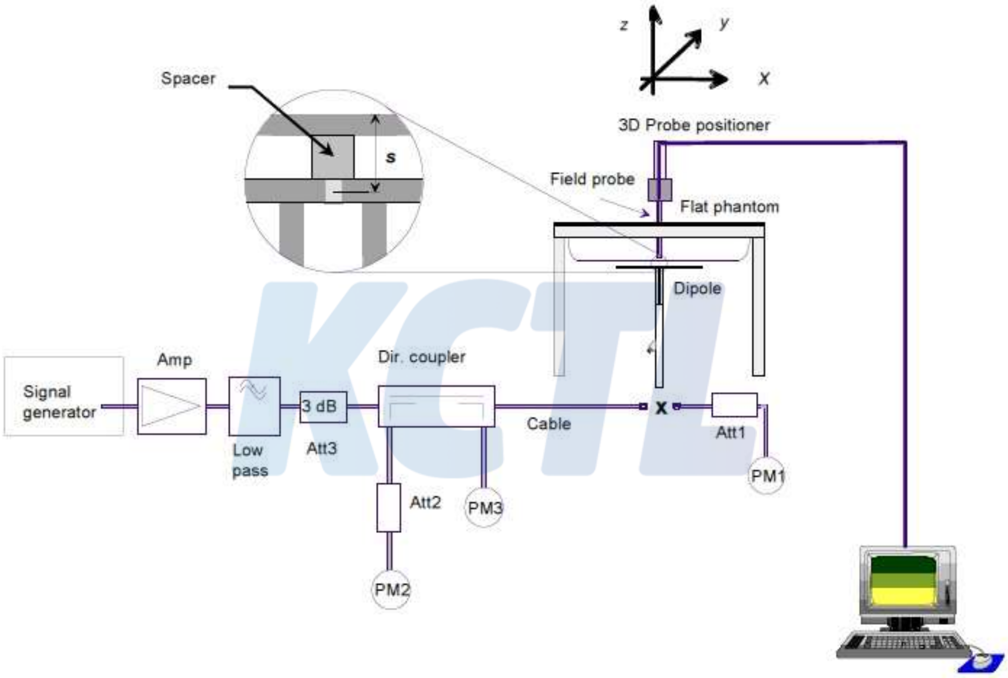
The dielectric properties for this Tissue Simulant Liquids were measured by using the SPEAG Model DAK3.5 Dielectric Probe in conjunction with Agilent E5071B Network Analyzer (300 kHz – 8 500 ㎒). The Conductivity (σ) and Permittivity (ρ) are listed in Table 1.For the SAR measurement given in this report. The temperature variation of the Tissue Simulant Liquids was (22 ± 2) ℃.

Freq. (㎒)	Limit/Measured		Permittivity (ρ)	Conductivity (σ)	Temp. (°C)
850.0	Recommended Limit		41.50 ± 5 % (39.43~43.58)	0.92 ± 5 % (0.87~0.97)	22 ± 2
	Measured	2020-08-12	40.52	0.93	20.43
2 450.0	Recommended Limit		39.20 ± 5 % (37.24~41.16)	1.80 ± 5 % (1.71~1.89)	22 ± 2
	Measured	2020-08-12	39.26	1.84	20.38

<Table 1. Measurement result of Tissue electric parameters>

9.2 Test System Verification

The microwave circuit arrangement for system verification is sketched below picture.
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 t arget 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 Table 2.
During the tests, the ambient temperature of the laboratory was in the range (22 ± 2) ℃, th e relative humidity was in the range(50 ± 20)% and the liquid depth Above the ear/grid refer ence 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.



Verification Kit	Probe S/N	Frequency (㎒)	Tissue Type	Limit/Measured (Normalized to 1 W)		
D850V2 SN: 1006	EX3DV4 SN: 3865	850.0	HSL	Recommended Limit 1g (Normalized)		9.95 ± 10 % (8.96~10.95)
				Measured	2020-08-12	10.16
D2450V2 SN: 895	EX3DV4 SN: 3697	2 450.0	HSL	Recommended Limit 1g (Normalized)		52.40 ± 10 % (47.16~57.64)
				Measured	2020-08-12	55.20

<Table 2. System Verification>

10. SAR Test Results

10.1 Standalone Head SAR Test Results

<Basic Model(SM-A013M/DS) Head Worst Configuration>

WLAN 2.4 ㎓										
Mode	EUT Position	Distance (㎜)	Frequency (㎒)	Measured Conducted Power (dBm)	Max. Tune-up Power (dBm)	Power Scaling Factor	Duty Cycle Compensate Factor	Measured 1 g SAR (W/kg)	Scaled 1 g SAR (W/kg)	Plot No.
802.11b	Right Cheek	0	2 462.0	15.75	16.00	1.059	1.007	0.790	0.843	-

<Derivative Model(SM-A013M) Head Worst Configuration>

WLAN 2.4 ㎓										
Mode	EUT Position	Distance (㎜)	Frequency (㎒)	Measured Conducted Power (dBm)	Max. Tune-up Power (dBm)	Power Scaling Factor	Duty Cycle Compensate Factor	Measured 1 g SAR (W/kg)	Scaled 1 g SAR (W/kg)	Plot No.
802.11b	Right Cheek	0	2 462.0	15.71	16.00	1.069	1.007	0.762	**0.820**	1

10.2 Standalone Body-Worn SAR Test Results

<Basic Model(SM-A013M/DS) Body-worn Worst Configuration>

GSM 850									
Mode	EUT Position	Distance (㎜)	Frequency (㎒)	Measured Conducted Power (dBm)	Max. Tune-up Power (dBm)	Power Scaling Factor	Measured 1 g SAR (W/kg)	Scaled 1 g SAR (W/kg)	Plot No.
GPRS 4Tx	Rear	15	836.6	29.41	30.00	1.146	0.657	0.753	-

<Derivative Model(SM-A013M) Body-worn Worst Configuration>

GSM 850									
Mode	EUT Position	Distance (㎜)	Frequency (㎒)	Measured Conducted Power (dBm)	Max. Tune-up Power (dBm)	Power Scaling Factor	Measured 1 g SAR (W/kg)	Scaled 1 g SAR (W/kg)	Plot No.
GPRS 4Tx	Rear	15	836.6	29.55	30.00	1.109	0.656	**0.728**	2

10.3 Standalone Hotspot SAR Test Results

<Basic Model(SM-A013M/DS) Hotspot Worst Configuration>

GSM 850									
Mode	EUT Position	Distance (㎜)	Frequency (㎒)	Measured Conducted Power (dBm)	Max. Tune-up Power (dBm)	Power Scaling Factor	Measured 1 g SAR (W/kg)	Scaled 1 g SAR (W/kg)	Plot No.
GPRS 4Tx	Rear	10	824.2	29.21	30.00	1.199	0.881	**1.057**	-

<Derivative Model(SM-A013M) Hotspot Worst Configuration>

GSM 850									
Mode	EUT Position	Distance (㎜)	Frequency (㎒)	Measured Conducted Power (dBm)	Max. Tune-up Power (dBm)	Power Scaling Factor	Measured 1 g SAR (W/kg)	Scaled 1 g SAR (W/kg)	Plot No.
GPRS 4Tx	Rear	10	824.2	29.15	30.00	1.216	0.855	**1.040**	3

General Notes:

1. The test data reported are the worst-case SAR values according to test procedures specified in IEEE 1528-2013, and FCC KDB Publication 447498 D01v06.
2. All modes of operation were investigated, and worst-case results are reported.
3. Battery is fully charged for all readings and the standard batteries are the only options.
4. Liquid tissue depth was at least 15 cm.
5. The manufacturer has confirmed that the device(s) tested have the same physical, mechanical and thermal characteristics and are within operational tolerances expected for production units.
6. SAR results were scaled to the maximum allowed power to demonstrate compliance per FCC KDB Publication 447498 D01v06.
7. Device was tested using a fixed spacing for body-worn accessory testing. A separation distance of 15 ㎜ was considered because the manufacturer has determined that there will be body-worn accessories available in the marketplace for users to support this separation distance.
8. Per FCC KDB Publication 648474 D04v01r03, body-worn SAR was evaluated without a headset connected to the device. Since the standalone reported body-worn SAR was ≤ 1.2 W/kg, no additional body-worn SAR evaluations using a headset cable were required.
9. This device utilizes power reduction for some wireless modes, as outlined in Section 2.3. The maximum output power allowed for each transmitter and exposure condition was evaluated for SAR compliance based on expected use conditions and simultaneous transmission scenarios.

GSM Notes:

1. Body-Worn accessory testing is typically associated with voice operations. Therefore, GSM voice was evaluated for body-worn SAR.

WLAN Notes:

1. Justification for test configurations for WLAN per KDB Publication 248227 D01v02r02 for 2.4㎓ WIFI operations, the highest measured maximum output power channel for DSSS was selected for SAR measurement. SAR for OFDM modes (2.4㎓ 802.11g/n) was not required due to the maximum allowed powers and the highest reported DSSS SAR.
2. The device was configured to transmit continuously at the required data rate, channel bandwidth and signal modulation, using the highest transmission duty factor supported by the test mode tools. The reported SAR was scaled to the 100% transmission duty factor to determine compliance.

11. SAR Measurement Variability

Per FCC KDB Publication 865664 D01v01r04, SAR measurement variability was assessed for each frequency band, which was determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. When both head and body tissue-equivalent media were required for SAR measurements in a frequency band, the variability measurement procedures were applied to the tissue medium with the highest measured SAR, using the highest measured SAR configuration for that tissue-equivalent medium. These additional measurements were repeated after the completion of all measurements requiring the same head or body tissue equivalent medium in a frequency band. The test device was returned to ambient conditions (normal room temperature) with the battery fully charged before it was re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

SAR Measurement Variability was assessed using the following procedures for each frequency band:

1) **Repeated measurements are not required when the original highest measured SAR is < 0.80 W/㎏.**
2) When the original highest measured SAR is ≥ 0.80 W/㎏, the measurement was repeated once.
3) A second repeated measurement was performed 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/㎏ (~ 10% from the 1-g SAR limit).
4) A third repeated measurement was performed only if the original, first or second repeated measurement was ≥ 1.5 W/㎏ and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.

Band	Frequency (㎒)	EUT Position	Separation Distance (㎜)	Measured 1 g SAR (W/㎏)	Repeated 1g SAR (W/㎏)	Ratio
N/A						

12. Measurement Uncertainty

Per KDB 865664 D01 SAR measurement 100㎒ to 6㎓, when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg and the measured 10-g SAR within a frequency band is < 3.75 W/kg. The expanded SAR measurement uncertainty must be ≤ 30%, for a confidence interval of *k* = 2. If these conditions are met, extensive SAR measurement uncertainty analysis described in IEEE Standard 1528-2013 is not required in SAR reports submitted for equipment approval. For this device, the highest measured 1-g SAR is less 1.5W/kg and highest measured 10-g SAR is less 3.75W/kg. Therefore, the measurement uncertainty table is not required in this report.

13. Test Equipment Information

Test Platform	SPEAG DASY5 System			
Version	DASY52: 52.10.4.1527 / SEMCAD: 14.6.14 (7483)			
Location	KCTL Inc, 65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, Korea			
Manufacture	SPEAG			
Hardware Reference				
Equipment	Model	Serial Number	Date of Calibration	Due date of next Calibration
Shield Room	-	8F - 2	-	-
Shield Room	-	8F - 3	-	-
DASY5 Robot	TX90XL	F12/5L7FA1/A/01	-	-
DASY6 Robot	TX90XL speag	F/18/0004968/A/001	-	-
Phantom	Twin SAM Phantom	1728	-	-
Phantom	Twin SAM Phantom	1975	-	-
Mounting Device	Mounting Device	-	-	-
DAE	DAE4	1586	2020-04-22	2021-04-22
DAE	DAE4	1567	2020-03-20	2021-03-20
Probe	EX3DV4	3865	2019-08-28	2020-08-28
Probe	EX3DV4	3697	2020-03-26	2021-03-26
ESG Vector Signal Generator	E4438C	MY42080486	2020-05-11	2021-05-11
ESG Vector Signal Generator	E4438C	MY42080845	2020-03-12	2021-03-12
Dual Power Meter	E4419B	GB43312301	2020-05-12	2021-05-12
Dual Power Meter	EPM-442A	GB37480680	2020-05-12	2021-05-12
Power Sensor	8481H	3318A 19379	2020-05-12	2021-05-12
Power Sensor	8481H	3318A 19377	2020-05-12	2021-05-12
Power Sensor	8481H	2703A11902	2020-05-12	2021-05-12
Power Sensor	8481H	3318A18090	2020-05-12	2021-05-12
Attenuator	8491B 3dB	17387	2020-05-12	2021-05-12
Attenuator	8491B 10dB	29425	2020-05-12	2021-05-12
Attenuator	8491B-6dB	MY39270294	2020-05-12	2021-05-12
Attenuator	8491A	21552	2020-05-12	2021-05-12
Attenuator	8491A	35934	2020-05-12	2021-05-12
Attenuator	8491A	35560	2020-05-12	2021-05-12
Power Amplifier	GRF5039	1062	2020-05-12	2021-05-12
Power Amplifier	AMP2027	10010	2020-05-12	2021-05-12
Dual Directional Coupler	778D	16059	2020-05-12	2021-05-12
Dual Directional Coupler	778D-012	50136	2020-05-12	2021-05-12
Low Pass Filter	LA-15N	36543	2020-05-12	2021-05-12
Low Pass Filter	VLF-3000+	31831	2020-05-12	2021-05-12
Dipole Validation Kits	D850V2	1006	2020-04-21	2022-04-21
Dipole Validation Kits	D2450V2	895	2020-07-21	2022-07-21
Network Analyzer	E5071B	MY42403524	2020-02-27	2021-02-27
Dielectric Assessment Kit	DAK-3.5	1078	2020-05-19	2021-05-19
Wideband Radio Communication Tester	CMW500	168683	2020-04-06	2021-04-06

14. Test System Verification Results

Date: 2020-08-12

Test Laboratory: KCTL Inc.
File Name: 850 MHz Verification Input Power 250 mW 2020-08-12.da52:0

DUT: Dipole 850 MHz D850V2, Type: D850V2, Serial: D850V2 - SN:1006

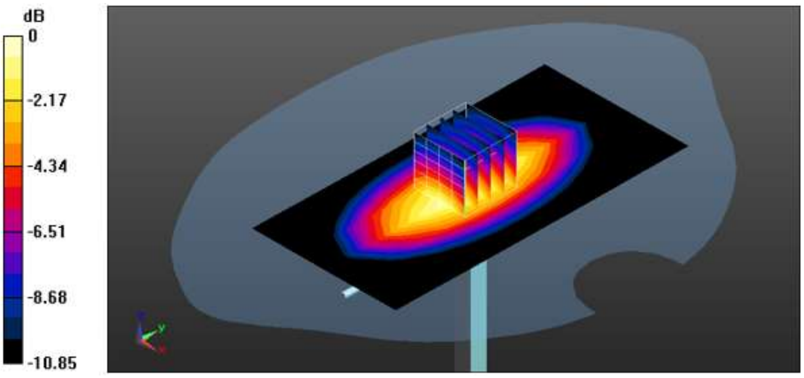
Communication System: UID 0, CW (0); Frequency: 850 MHz; Duty Cycle: 1:1
Medium parameters used: f = 850 MHz; σ = 0.929 S/m; ε_r = 40.515; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3865; ConvF(10.07, 10.07, 10.07) @ 850 MHz; ; Calibrated: 2019-08-28
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1586; Calibrated: 2020-04-22
- Phantom: SAM twin 1728; Type: QD000P40CD; Serial: TP:1728
- Measurement SW: DASY52, Version 52.10 (4);

System Performance Check/850 MHz Verification Input Power 250 mW 2020-08-12/Area Scan (7x13x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 3.38 W/kg

System Performance Check/850 MHz Verification Input Power 250 mW 2020-08-12/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 63.29 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 3.81 W/kg
SAR(1 g) = 2.54 W/kg; SAR(10 g) = 1.66 W/kg
Smallest distance from peaks to all points 3 dB below = 16.1 mm
Ratio of SAR at M2 to SAR at M1 = 66.5%
Maximum value of SAR (measured) = 3.40 W/kg



0 dB = 3.40 W/kg = 5.31 dBW/kg

Date: 8/12/2020

Test Laboratory: KCTL Inc.
File Name: 2450 MHz Verification Iuput Power 100 mW 2020-08-12.da52:0

DUT: Dipole 2450 MHz D2450V2, Type: D2450V2, Serial: D2450V2 - SN:895

Communication System: UID 0, CW (0); Frequency: 2450 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2450 MHz; σ = 1.835 S/m; ε_r = 39.255; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

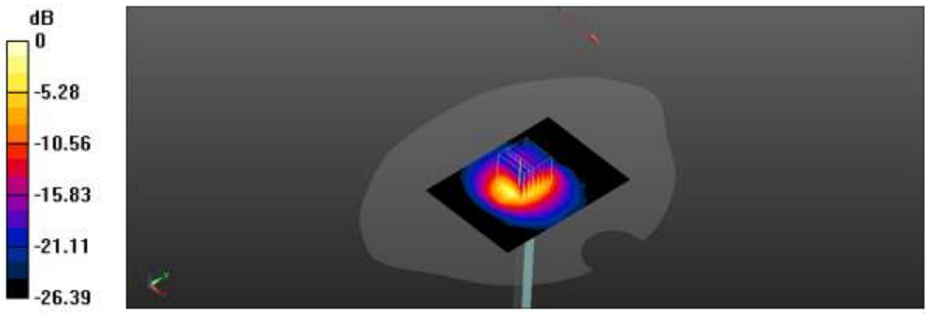
- Probe: EX3DV4 - SN3697;ConvF(7.08, 7.08, 7.08) @ 2450 MHz; Calibrated: 3/26/2020
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1567; Calibrated: 3/20/2020
- Phantom: Back_Right_Twin-SAM V8.0; Type: QD 000 P41 AA; Serial: 1975
- Measurement SW: DASY52, Version 52.10 (4);

System Performance Check (without Area Scan)/2450 MHz Verification Input Power 100 mW 2020-08-12/Area Scan (9x12x1): Measurement grid: dx=12mm, dy=12mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 8.32 W/kg

System Performance Check (without Area Scan)/2450 MHz Verification Input Power 100 mW 2020-08-12/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 70.94 V/m; Power Drift = -0.10 dB
Peak SAR (extrapolated) = 12.4 W/kg
SAR(1 g) = 5.52 W/kg; SAR(10 g) = 2.49 W/kg
Smallest distance from peaks to all points 3 dB below = 9.5 mm
Ratio of SAR at M2 to SAR at M1 = 44%

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 9.52 W/kg



0 dB = 9.52 W/kg = 9.79 dBW/kg

15. Test Results

1)

Date: 8/12/2020

Test Laboratory: KCTL Inc.
File Name: 1.WLAN 2.4G_Head.da53:0

DUT: SM-A013M, Type: Mobile Phone, Serial: R38N502CV2J

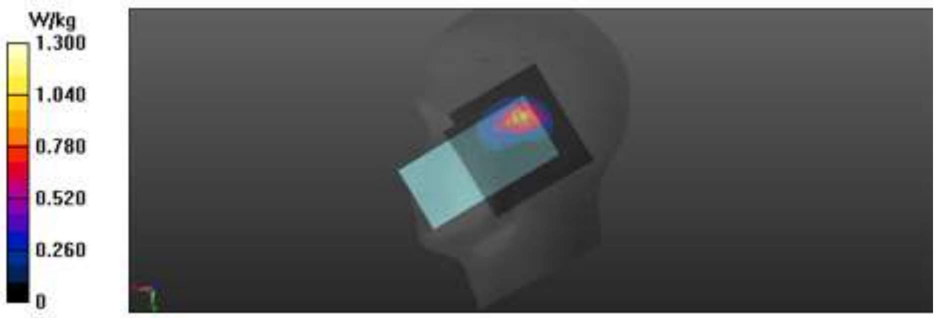
Communication System: UID 0, 2.4GWLAN (0); Frequency: 2462 MHz; Duty Cycle: 1:1
Medium parameters used: f = 2462 MHz; σ = 1.85 S/m; ε_r = 39.262; ρ = 1000 kg/m^3
Phantom section: Right Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3697;ConvF(7.08, 7.08, 7.08) @ 2462 MHz; Calibrated: 3/26/2020
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1567; Calibrated: 3/20/2020
- Phantom: Back_Right_Twin-SAM V8.0; Type: QD 000 P41 AA; Serial: 1975
- Measurement SW: DASY52, Version 52.10 (4);

Configuration/802.11b_CH11_Right Cheek/Area Scan (10x10x1): Measurement grid: dx=12mm, dy=12mm
Maximum value of SAR (measured) = 1.25 W/kg

Configuration/802.11b_CH11_Right Cheek/Zoom Scan (7x8x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 17.38 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 1.66 W/kg
SAR(1 g) = 0.762 W/kg; SAR(10 g) = 0.347 W/kg
Smallest distance from peaks to all points 3 dB below = 9.3 mm
Ratio of SAR at M2 to SAR at M1 = 44.8%
Maximum value of SAR (measured) = 1.30 W/kg



2)

Date: 2020-08-12

Test Laboratory: KCTL Inc.
File Name: 1.GSM850_Body_Worn.da53:0

DUT: SM-A013M, Type: Mobile Phone, Serial: R38N60177CF

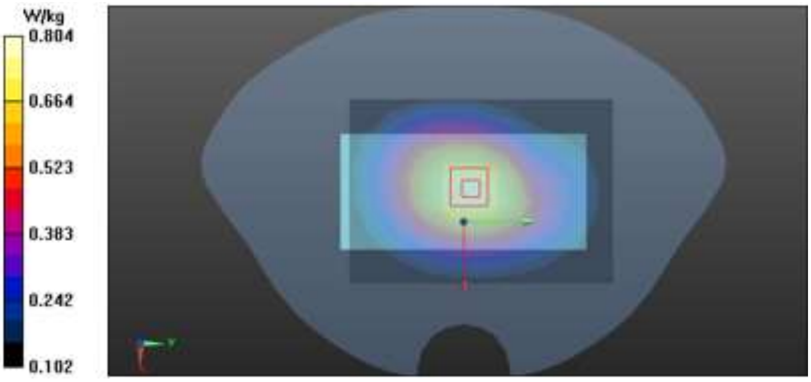
Communication System: UID 0, GSM850 (0); Frequency: 836.6 MHz; Duty Cycle: 1:8.30042
Medium parameters used: f = 836.6 MHz; σ = 0.915 S/m; ε_r = 40.658; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3865; ConvF(10.07, 10.07, 10.07) @ 836.6 MHz; ; Calibrated: 2019-08-28
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1586; Calibrated: 2020-04-22
- Phantom: SAM twin 1728; Type: QD000P40CD; Serial: TP:1728
- Measurement SW: DASY52, Version 52.10 (4);

Configuration/GSM850_GPRS 4Tx_CH190_Rear_15 mm/Area Scan (8x11x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.768 W/kg

Configuration/GSM850_GPRS 4Tx_CH190_Rear_15 mm/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 30.96 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 0.866 W/kg
SAR(1 g) = 0.656 W/kg; SAR(10 g) = 0.480 W/kg
Smallest distance from peaks to all points 3 dB below: Larger than measurement grid
Ratio of SAR at M2 to SAR at M1 = 74.7%
Maximum value of SAR (measured) = 0.804 W/kg



3)

Date: 2020-08-12

Test Laboratory: KCTL Inc.
File Name: 1.GSM850_Hotspot.da53:0

DUT: SM-A013M, Type: Mobile Phone, Serial: R38N60177CF

Communication System: UID 0, GSM850_4TX (0); Frequency: 824.2 MHz; Duty Cycle: 1:2.07491
Medium parameters used: f = 824.2 MHz; σ = 0.905 S/m; ε_r = 40.759; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3865; ConvF(10.07, 10.07, 10.07) @ 824.2 MHz; ; Calibrated: 2019-08-28
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1586; Calibrated: 2020-04-22
- Phantom: SAM twin 1728; Type: QD000P40CD; Serial: TP:1728
- Measurement SW: DASY52, Version 52.10 (4);

Configuration/GSM850_GPRS 4Tx_CH128_Rear_10 mm/Area Scan (8x11x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.995 W/kg

Configuration/GSM850_GPRS 4Tx_CH128_Rear_10 mm/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 34.27 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 1.08 W/kg
SAR(1 g) = 0.855 W/kg; SAR(10 g) = 0.646 W/kg
Smallest distance from peaks to all points 3 dB below: Larger than measurement grid
Ratio of SAR at M2 to SAR at M1 = 79.6%
Maximum value of SAR (measured) = 1.01 W/kg