TEST REPORT

APPLICANT	**:**	Jiangsu SEUIC Technology Co.,Ltd.
PRODUCT NAME	**:**	Portable Data Collection Terminal
MODEL NAME	**:**	CRUISE 1
BRAND NAME	**:**	CRUISE/SEUIC
FCC ID	**:**	2AC68-CRUISE1P
STANDARD(S)	**:**	47CFR 2.1093 IEEE 1528-2013
RECEIPT DATE	**:**	2018-10-16
TEST DATE	**:**	2018-10-22 to 2018-12-20
ISSUE DATE	**:**	2018-12-22

Edited by : Liang Yumei

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DIRECTORY

Change history			
Version	**Date**	**Reason for change**	**Test engineer**
1.0	2018-12-22	Original	Liang Yumei Chen Hao

1. SAR Results Summary

The maximum results of Specific Absorption Rate (SAR) found during test as bellows:

<Highest Reported standalone SAR Summary>

Frequency Band		Highest SAR Summary		
		Head (Separation 0mm)	Body-worn (Separation 10mm)	Hotspot (Separation 10mm)
		1g SAR (W/kg)		
GSM	GSM850	0.166	0.203	0.203
	GSM1900	0.453	0.658	1.071
WCDMA	WCDMA Band II	0.425	0.706	0.995
	WCDMA Band V	0.207	0.311	0.311
LTE	LTE Band 2	0.313	0.605	0.933
	LTE Band 4	0.481	0.690	0.976
	LTE Band 5	0.075	0.202	0.202
	LTE Band 7	0.304	0.409	0.409
WLAN	2.4GHz WLAN	0.089	0.043	0.043
	5GHz WLAN	0.072	0.023	0.031
2.4GHz Band	Bluetooth	N/A	N/A	N/A
Highest Simultaneous Transmission		Head	Body-worn	Hotspot
WWAN + 2.4GHz WLAN		0.528	0.724	1.071
WWAN + 5GHz WLAN		0.513	0.725	1.071

Max Scaled SAR_{1g} (W/Kg):	Head:	0.481 W/kg	Limit(W/kg): 1.6 W/kg
	Body:	0.706 W/kg	
	Hotspot:	1.071 W/kg	

Note:

This device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6W/kg as averaged over any 1 gram of tissue; specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-1992, and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2013 and FCC KDB publications.

2. Technical Information

Note: Provide by applicant.

2.1. Applicant and Manufacturer Information

Applicant:	Jiangsu SEUIC Technology Co.,Ltd.
Applicant Address:	NO.15 Xinghuo Road,Nanjing New & High Technology Industry Development Zone,210061,Nanjing City,Jiangsu Province,China
Manufacturer:	Jiangsu SEUIC Technology Co.,Ltd.
Manufacturer Address:	NO.15 Xinghuo Road,Nanjing New & High Technology Industry Development Zone,210061,Nanjing City,Jiangsu Province,China

2.2. Equipment Under Test (EUT) Description

EUT Type:	Portable Data Collection Terminal
Hardware Version:	SLB761_MB_V1.02_PCB
Software Version:	D700P_I_V1.1.5
Frequency Bands:	GSM 850: 824.2 MHz ~ 848.8 MHz GSM 1900: 1850.2 MHz ~ 1909.8 MHz WCDMA Band II: 1852.4 MHz ~ 1907.6 MHz WCDMA Band V: 826.4 MHz ~ 846.6 MHz LTE Band 2: 1850 MHz ~ 1910 MHz LTE Band 4: 1710 MHz ~ 1755 MHz LTE Band 5: 824 MHz ~ 849 MHz LTE Band 7: 2500 MHz ~ 2570 MHz WLAN 2.4GHz: 2412 MHz ~ 2462 MHz WLAN 5.2GHz: 5150 MHz ~ 5250 MHz WLAN 5.3GHz: 5250 MHz ~ 5350 MHz WLAN 5.5GHz: 5470 MHz ~ 5725 MHz WLAN 5.8GHz: 5725 MHz ~ 5850 MHz Bluetooth: 2402 MHz ~ 2480 MHz
Modulation Mode:	GSM/GPRS: GMSK EDGE: 8PSK WCDMA: QPSK/16QAM LTE: QPSK/16QAM 802.11b: DSSS 802.11a/g/n HT20/ac-VHT40/VHT80: OFDM Bluetooth BR+EDR: GFSK, π/4-DQPSK, 8-DPSK Bluetooth LE: GFSK

Multi-slot Class:	GPRS: Multi-slot Class 12; EDGE: Multi-slot Class 12;
Operation Class:	Class B
Hotspot Mode:	Support
Antenna Type:	PIFA antenna
Battery:	4500mAh 3.8V
SIM Cards Description:	For dual SIM card version, SIM 1 and SIM 2 are the same chipset unit and tested as a single chipset, the SIM 1 is chosen for test

Note: For a more detailed description, please refer to specification or user's manual supplied by the applicant and/or manufacturer.

2.3. Photographs of the EUT

Normal Temperature (NT):	20 ... 25 °C
Relative Humidity:	30 ... 75 %
Air Pressure:	980 ... 1020 hPa

Test frequency:	GSM 850MHz/1900MHz; WCDMA Band II/V; FDD-LTE Band 2/4/5/7; WLAN 2.4GHz; WLAN 5GHz;
Operation mode:	Call established
Power Level:	GSM 850 MHz Maximum output power(level 5) GSM 1900MHz Maximum output power(level 0) WCDMA Band II/V (All Up Bits) FDD-LTE Band 2/4/5/7 (Maximum output power) WLAN 2.4GHz (Maximum output power) WLAN 5GHz (Maximum output power)

During SAR test, EUT is in Traffic Mode (Channel Allocated) at Normal Voltage Condition. A communication link is set up with a System Simulator (SS) by air link, and a call is established.

The EUT shall use its internal transmitter. The antenna(s), battery and accessories shall be those specified by the Factory. The EUT battery must be fully charged and checked periodically during the test to ascertain uniform power output. If a wireless link is used, the antenna connected to the output of the base station simulator shall be placed at least 50 cm away from the handset.
The signal transmitted by the simulator to the antenna feeding point shall be lower than the output power level of the handset by at least 35 dB.

For SAR testing, EUT is in GPRS mode. In GPRS link mode, its crest factor is 2, because EUT is set in GPRS multi-slot class 12 with 4 uplink slots. In WCDMA and WI-FI mode, its crest factor is 1.

3. Specific Absorption Rate (SAR)

3.1. Introduction

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

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:

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

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

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

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

Where C is the specific head capacity, $\delta\mathrm{T}$ is the temperature rise and $\delta\mathrm{t}$ the exposure duration, or related to the electrical field in the tissue by

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

Where σ is the conductivity of the tissue, ρ is the mass density of the tissue and $|\mathrm{E}|$ is the rms electrical field strength.

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

4. RF Exposure Limits

Limits for General Population/Uncontrolled Exposure (W/kg)

Type Exposure	Uncontrolled Environment Limit
Spatial Peak SAR (1g cube tissue for head and trunk)	1.60W/kg
Spatial Peak SAR (10g cube tissue for limbs)	4.00W/kg
Spatial Peak SAR (1g cube tissue for whole body)	0.08 W/kg

Note:

1. This limit is according to recommendation1999/519/EC, Annex II (Basic Restrictions)
2. Occupational/Uncontrolled Environments are defined as locations where there is exposure that may be incurred by people who are aware of the potential for exposure,(i.e. as a result of employment or occupation)

5. Applied Reference Documents

Leading reference documents for testing:

No.	Identity	Document Title
1	**47 CFR§2.1093**	Radiofrequency Radiation Exposure Evaluation: Portable Devices
2	**IEEE 1528-2013**	IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques
3	**KDB 447498 D01v06**	General RF Exposure Guidance
4	**KDB 248227 D01v02r02**	SAR Measurement Procedures for 802.11 Transmitters
5	**KDB 865664 D01v01r04**	SAR Measurement 100 MHz to 6 GHz
6	**KDB 865664 D02v01r02**	RF Exposure Reporting
7	**KDB 648474 D04v01r03**	Handset SAR
8	**KDB 941225 D01v03r01**	3G SAR MEAUREMENT PROCEDURES
9	**KDB 941225 D05v02r05**	SAR Evaluation Consideration for LTE Devices
10	**KDB 941225 D06v02r01**	SAR Evaluation Procedures For Portable Devices With Wireless Router Capabilities

6. SAR Measurement System

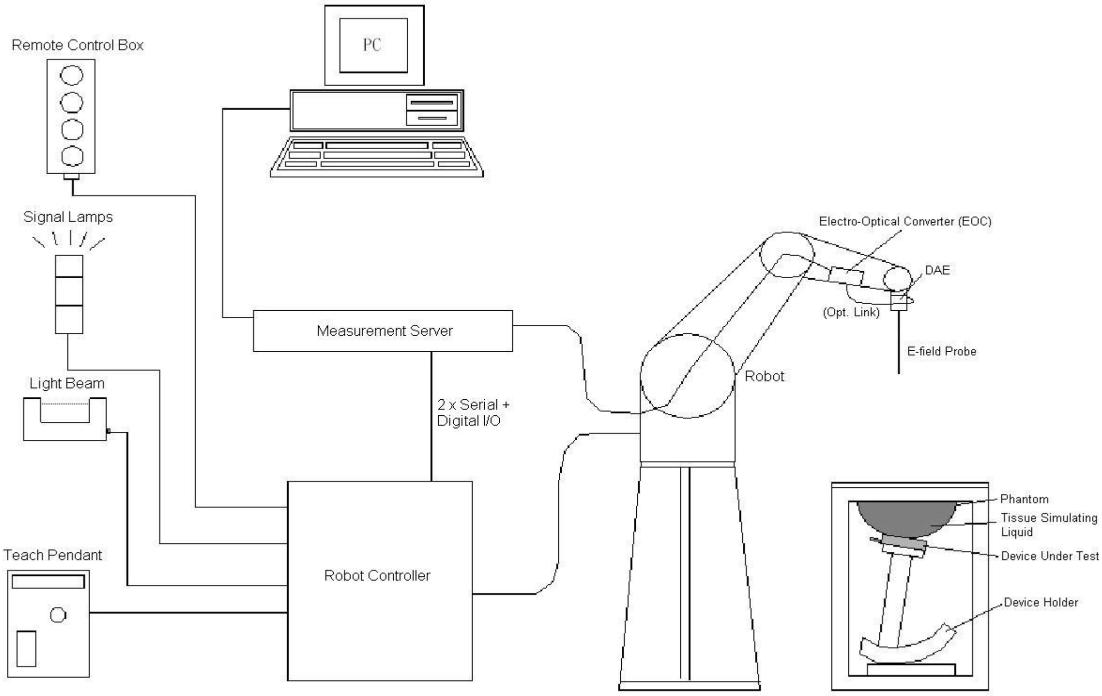


Fig 6.1 SPEAG DASY System Configurations

The DASY system for performance compliance tests is illustrated above graphically. This system consists of the following items:

A standard high precision 6-axis robot with controller, a teach pendant and software

A data acquisition electronic (DAE) attached to the robot arm extension

A dosimetric probe equipped with an optical surface detector system

The electro-optical converter (ECO) performs the conversion between optical and electrical signals

A measurement server performs the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.

A probe alignment unit which improves the accuracy of the probe positioning

A computer operating Windows XP

DASY software

Remove control with teach pendant and additional circuitry for robot safety such as warming lamps, etc.

The SAM twin phantom

A device holder

Tissue simulating liquid

Dipole for evaluating the proper functioning of the system

Some of the components are described in details in the following sub-sections.

6.1. E-Field Probe

The SAR measurement is conducted with the dosimetric probe (manufactured by SPEAG).The probe is specially designed and calibrated for use in liquid with high permittivity. The dosimetric probe has special calibration in liquid at different frequency. This probe has a built in optical surface detection system to prevent from collision with phantom.

E-Field Probe Specification

<EX3DV4 Probe>

Construction	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)	
Frequency	10 MHz to 6 GHz; Linearity: ± 0.2 dB	
Directivity	± 0.3 dB in HSL (rotation around probe axis) ± 0.5 dB in tissue material (rotation normal to probe axis)	
Dynamic Range	10 µW/g to 100 mW/g; Linearity: ± 0.2 dB	
Dimensions	Overall length: 330 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm	**Fig 6.3 Photo of EX3DV4**

E-Field Probe Calibration

Each probe needs to be calibrated according to a dosimetric assessment procedure with accuracy better than ± 10%. The spherical isotropy shall be evaluated and within ± 0.25 dB. The sensitivity parameters (NormX, NormY, and NormZ), the diode compression parameter (DCP) and the conversion factor (ConvF) of the probe are tested. The calibration data can be referred to appendix C of this report.

6.2. Data Acquisition Electronics (DAE)

The data acquisition electronics(DAE) consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit. AD-converter and a command decoder and control logic unit. Transmission to the measurement server is accomplished through an optical downlink for data and status information as well as an optical uplink for commands and the clock. The input impedance of the DAE is 200 MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.

Fig 6.4Photo of DAE

6.3. Robot

The SPEAG DASY system uses the high precision robots (DASY4: RX90BL; DASY5: TX90XL) type from Stäubli SA (France). For the 6-axis controller system, the robot controller version (DASY4: CS7MB; DASY5: CS8c) from Stäubli is used. The Stäubli robot series have many features that are important for our application:
High precision (repeatability ±0.035 mm)
High reliability (industrial design)
Jerk-free straight movements
Low ELF interference (the closed metallic construction shields against motor control fields)

Fig 6.5 Photo of DASY5

6.4. Measurement Server

The measurement server is based on a PC/104 CPU board with CPU (DASY4: 166 MHz, Intel Pentium;

DASY5: 400 MHz, Intel Celeron), chip disk (DASY4: 32 MB; DASY5: 128 MB), RAM (DASY4: 64 MB, DASY5: 128 MB). The necessary circuits for communication with the DAE electronic box, as well as the 16 bit AD converter system for optical detection and digital I/O interface are contained on the DASY I/O board, which is directly connected to the PC/104 bus of the CPU board.

The measurement server performs all the real-time data evaluation for field measurements and surface detection, controls robot movements and handles safety operations.

Fig 6.6 Photo of Server for DASY5

6.5. Light Beam Unit

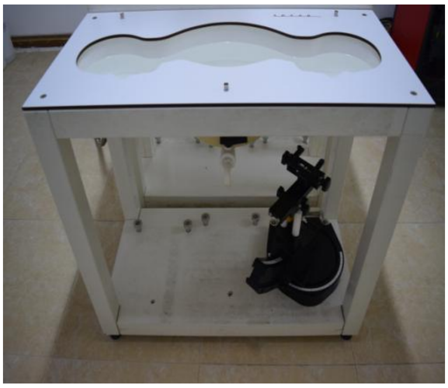
The light beam switch allows automatic "tooling" of the probe. During the process, the actual position of the probe tip with respect to the robot arm is measured, as well as the probe length and the horizontal probe offset. The software then corrects all movements, such that the robot coordinates are valid for the probe tip.

The repeatability of this process is better than0.1 mm. If a position has been taught with an aligned probe, the same position will be reached with another aligned probe within 0.1 mm, even if the other probe has different dimensions. During probe rotations, the probe tip will keep its actual position.

Fig. 6.7 Photo of Light Beam

6.6. Phantom

<SAM Twin Phantom>

Shell Thickness	2 ± 0.2 mm (sagging: <1%) Center ear point: 6 ± 0.2 mm	 **Fig 6.8Photo of SAM Phantom**
Filling Volume	Approx. 25 liters	
Dimensions	Length: 1000 mm; Width: 500 mm; Height: adjustable feet	
Measurement Areas	Left Hand, Right Hand, Flat Phantom	

The bottom plate contains three pair of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections. A white cover is provided to tap the phantom during off-periods to prevent water evaporation and changes in the liquid parameters. On the phantom top, three reference markers are provided to identify the phantom position with respect to the robot.

6.7. Device Holder

<Device Holder for SAM Twin Phantom>

The SAR in the phantom is approximately inversely proportional to the square of the distance between the source and the liquid surface. For a source at 5 mm distance, a positioning uncertainty of ± 0.5 mm would produce a SAR uncertainty of ± 20 %. Accurate device positioning is therefore crucial for accurate and repeatable measurements. The positions in which the devices must be measured are defined by the standards.

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

The DASY device holder is constructed of low-loss POM material having the following dielectric parameters: relative permittivity ε = 3 and loss tangent δ = 0.02. The amount of dielectric material has been reduced in the closest vicinity of the device, since measurements have suggested that the influence of the clamp on the test results could thus be lowered.

Fig 6.9 Device Holder

<Laptop Extension Kit>

The extension is lightweight and made of POM, acrylic glass and foam. It fits easily on the upper part of the mounting device in place of the phone positioned. The extension is fully compatible with the SAM Twin and ELI phantoms.

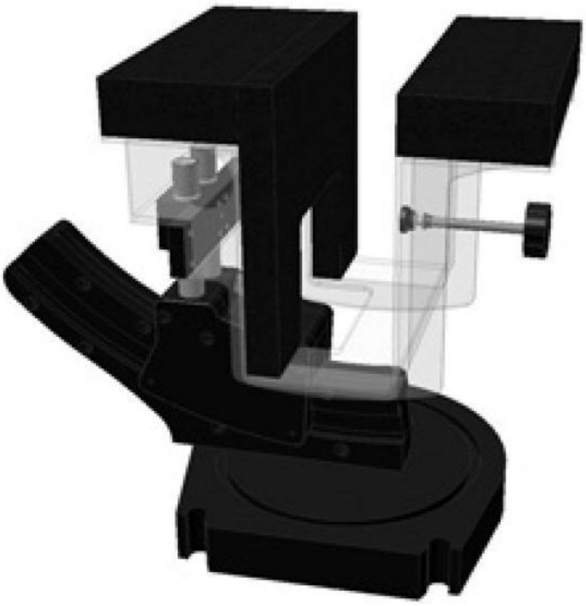


Fig 6.10 Laptop Extension Kit

6.8. Data Storage and Evaluation

Data Storage

The DASY software stores the assessed data from the data acquisition electronics as raw data (in microvolt readings from the probe sensors), together with all the necessary software parameters for the data evaluation (probe calibration data, liquid parameters and device frequency and modulation data) in measurement files. The post-processing software evaluates the desired unit and format for output each time the data is visualized or exported. This allows verification of the complete software setup even after the measurement and allows correction of erroneous parameter settings. For example, if a measurement has been performed with an incorrect crest factor parameter in the device setup, the parameter can be corrected afterwards and the data can be reevaluated.

The measured data can be visualized or exported in different units or formats, depending on the selected probe type (e.g., [V/m], [A/m], [mW/g]). Some of these units are not available in certain situations or give meaningless results, e.g., a SAR-output in a non-lose media, will always be zero. Raw data can also be exported to perform the evaluation with other software packages.

Data Evaluation

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

Probe parameters:	- Sensitivity	$Norm_i$, a_{i0}, a_{i1}, a_{i2}
	- Conversion factor	$ConvF_i$
	- Diode compression point	dcpi
Device parameters:	- Frequency	f
	- Crest factor	cf
Media parameters:	- Conductivity	σ
	- Density	ρ

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

The first step of the evaluation is a linearization of the filtered input signal to account for the compression characteristics of the detector diode. The compensation depends on the input signal, the diode type and the DC-transmission factor from the diode to the evaluation electronics. If the exciting field is pulsed, the crest factor of the signal must be known to correctly compensate for peak power.

The formula for each channel can be given as:

$$V_i = U_i + U_i^2 \times \frac{cf}{dcp_i}$$

With Vi = compensated signal of channel i, (i = x, y, z)
Ui = input signal of channel i, (i = x, y, z)
cf = crest factor of exciting field (DASY parameter)
dcpi = diode compression point (DASY parameter)

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

$$\text{E-field Probes:} E_i = \sqrt{\frac{V_i}{Norm_i \times ConvF}}$$

$$\text{H-field Probes:} H_i = \sqrt{V_i} \times \frac{a_{i0} + a_{i1} + a_{i2} f^2}{f}$$

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

$Norm_i$ = sensor sensitivity of channel i, (i = x, y, z), μV/(V/m)^2 for E-field

Probes ConvF = sensitivity enhancement in solution

a_{ij} = sensor sensitivity factors for H-field probes

f = carrier frequency [GHz]

E_i = electric field strength of channel i in V/m

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

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

$$E_{tot} = \sqrt{E_x^2 + E_y^2 + E_z^2}$$

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

$$SAR = E_{tot}^2 \times \frac{\sigma}{\rho \times 1000}$$

with SAR = local specific absorption rate in mW/g

E_{tot} = total field strength in V/m

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

ρ = equivalent tissue density in g/cm^3

Note that the density is set to 1, to account for actual head tissue density rather than the density of the tissue simulating liquid.

7. Tissue Simulating Liquids

For SAR measurement of the field distribution inside the phantom, the phantom must be filled with homogeneous tissue simulating liquid to a depth of at least 15 cm. For head SAR testing, the liquid height from the ear reference point (ERP) of the phantom to the liquid top surface is larger than 15 cm. For body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15 cm, which is shown in Fig. 5.1. For body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15 cm, which is shown in Fig. 5.2.The nominal dielectric values of the tissue simulating liquids in the phantom and the tolerance of 5% are listed in below table.

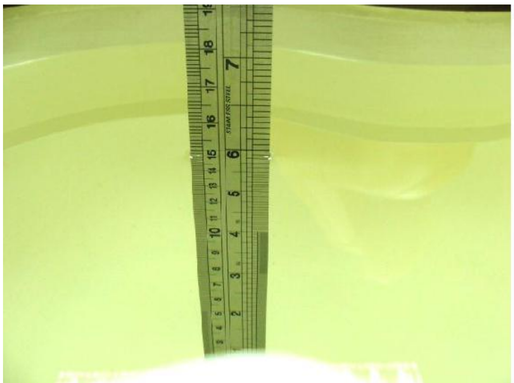


Fig 7.1 Photo of Liquid Height for Head SAR

Fig 7.2 Photo of Liquid Height for Body SAR

The following table gives the recipes for tissue simulating liquids

Frequency (MHz)	Water (%)	Sugar (%)	Cellulose (%)	Salt (%)	Preventol (%)	DGBE (%)	Conductivity (σ)	Permittivity (εr)
Head								
750	41.1	57.0	0.2	1.4	0.2	0	0.89	41.9
835	40.3	57.9	0.2	1.4	0.2	0	0.90	41.5
1800, 1900, 2000	55.2	0	0	0.3	0	44.5	1.40	40.0
2450	55.0	0	0	0	0	45.0	1.80	39.2
2600	54.8	0	0	0.1	0	45.1	1.96	39.0
Body								
750	51.7	47.2	0	0.9	0.1	0	0.96	55.5
835	50.8	48.2	0	0.9	0.1	0	0.97	55.2
1800, 1900, 2000	70.2	0	0	0.4	0	29.4	1.52	53.3
2450	68.6	0	0	0	0	31.4	1.95	52.7
2600	68.1	0	0	0.1	0	31.8	2.16	52.5

Simulating Liquid for 5GHz, Manufactured by SPEAG

Ingredients	(% by weight)
Water	64~78%
Mineral oil	11~18%
Emulsifiers	9~15%
Additives and Salt	2~3%

Note: Please refer to the validation results for dielectric parameters of each frequency band.

The dielectric properties of the tissue simulating liquids were verified prior to the SAR evaluation using an Agilent 85033E Dielectric Probe Kit and an Agilent Network Analyzer.

Table 1: Dielectric Performance of Tissue Simulating Liquid

Frequency (MHz)	Tissue Type	Liquid Temp. (℃)	Conductivity (σ)	Conductivity Target (σ)	Delta (σ) (%)	Limit (%)	Date
835	HSL	22.5	0.922	0.90	2.44	±5	2018-10-24
1750	HSL	22.5	1.387	1.37	1.24	±5	2018-10-25
1900	HSL	22.6	1.460	1.40	4.29	±5	2018-11-17
2450	HSL	22.3	1.865	1.80	3.61	±5	2018-12-20
2600	HSL	22.7	2.028	1.96	3.47	±5	2018-10-23
5250	HSL	22.1	4.696	4.71	-0.30	±5	2018-12-20
5600	HSL	22.1	5.075	5.07	0.10	±5	2018-12-20
5750	HSL	22.1	5.432	5.22	4.06	±5	2018-12-20
835	MSL	22.8	0.947	0.97	-2.37	±5	2018-10-24
1750	MSL	22.9	1.488	1.49	-0.13	±5	2018-10-23
1900	MSL	22.4	1.519	1.52	-0.07	±5	2018-10-24
2450	MSL	22.3	2.039	1.95	4.56	±5	2018-12-19
2600	MSL	22.2	2.188	2.16	1.30	±5	2018-10-22
5250	MSL	22.3	5.364	5.36	0.07	±5	2018-12-19
5600	MSL	22.3	5.679	5.77	-1.58	±5	2018-12-19
5750	MSL	22.3	6.182	5.94	4.07	±5	2018-12-19

Frequency (MHz)	Tissue Type	Liquid Temp. (℃)	Permittivity (ε_r)	Permittivity Target (ε_r)	Delta (ε_r) (%)	Limit (%)	Date
835	HSL	22.5	42.273	41.50	1.86	±5	2018-10-24
1750	HSL	22.5	39.860	40.10	-0.60	±5	2018-10-25
1900	HSL	22.6	40.899	40.00	2.25	±5	2018-11-17
2450	HSL	22.3	37.909	39.20	-3.29	±5	2018-12-20
2600	HSL	22.7	39.189	39.00	0.48	±5	2018-10-23
5250	HSL	22.1	37.048	35.95	3.05	±5	2018-12-20
5600	HSL	22.1	36.416	35.50	2.58	±5	2018-12-20
5750	HSL	22.1	35.732	35.35	1.08	±5	2018-12-20
835	MSL	22.8	54.348	55.20	-1.54	±5	2018-10-24
1750	MSL	22.9	54.077	53.40	1.27	±5	2018-10-23
1900	MSL	22.4	53.569	53.30	0.50	±5	2018-10-24
2450	MSL	22.3	50.603	52.70	-3.98	±5	2018-12-19
2600	MSL	22.2	50.734	52.50	-3.36	±5	2018-10-22
5250	MSL	22.3	48.458	48.95	-1.01	±5	2018-12-19
5600	MSL	22.3	47.843	48.50	-1.35	±5	2018-12-19
5750	MSL	22.3	47.417	48.28	-1.79	±5	2018-12-19

8. SAR System Verification

Each DASY system is equipped with one or more system validation kits. These units, together with the predefined measurement procedures within the DASY software, enable the user to conduct the system performance check and system validation. System validation kit includes a dipole, tripod holder to fix it underneath the flat phantom and a corresponding distance holder.

8.1. Purpose of System Performance check

The system performance check verifies that the system operates within its specifications. System and operator errors can be detected and corrected. It is recommended that the system performance check be performed prior to any usage of the system in order to guarantee reproducible results. The system performance check uses normal SAR measurements in a simplified setup with a well characterized source. This setup was selected to give a high sensitivity to all parameters that might fail or vary over time. The system check does not intend to replace the calibration of the components, but indicates situations where the system uncertainty is exceeded due to drift or failure.

8.2. System Setup

The output power on dipole port must be calibrated to 24 dBm (250 mW) before dipole is connected.
In the simplified setup for system evaluation, the DUT is replaced by a calibrated dipole and the power source is replaced by a continuous wave which comes from a signal generator. The calibrated dipole must be placed beneath the flat phantom section of the SAM twin phantom with the correct distance holder. The distance holder should touch the phantom surface with a light pressure at the reference marking and be oriented parallel to the long side of the phantom. The system check verifies that the system operates within its specifications. It is performed daily or before every SAR measurement. The system check uses normal SAR measurements in the flat section of the phantom with a matched dipole at a specified distance. The system verification setup is shown as below.

Fig 8.1 Photo of Dipole Setup

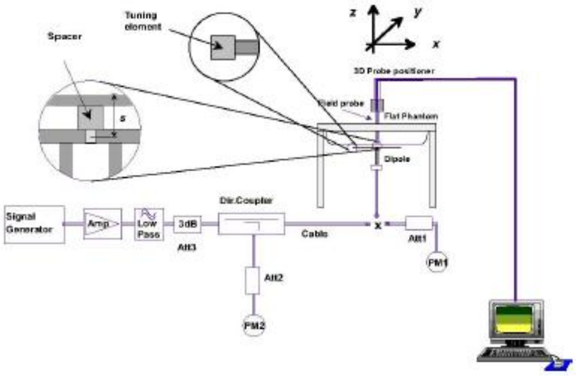


Fig 8.2 System Setup for System Evaluation

8.3. Validation Results

After system check testing, the SAR result will be normalized to 1W forward input power and compared with the reference SAR value derived from validation dipole certificate report. The deviation of system check should be within 10 %.

<Validation Setup>

Frequency (MHz)2	Tissue Type2	Input Power (mW)	Dipole S/N	Probe S/N	DAE S/N
835	HSL	250	D835V2-4d227	7445	1516
1750	HSL	250	D1750V2-1160	7445	1516
1900	HSL	250	D1900V2_5d221	7445	1516
2450	HSL	250	D2450V2-997	3823	480
2600	HSL	250	D2600V2-1139	7445	1516
5250	HSL	100	D5GHzV2-1176-5250	3823	480
5600	HSL	100	D5GHzV2-1176-5600	3823	480
5750	HSL	100	D5GHzV2-1176-5800	3823	480
835	MSL	250	D835V2-4d227	7445	1516
1750	MSL	250	D1750V2-1160	7445	1516
1900	MSL	250	D1900V2_5d221	7445	1516
2450	MSL	250	D2450V2-997	7445	1516
2600	MSL	250	D2600V2-1139	3823	480
5250	MSL	100	D5GHzV2-1176-5250	7445	1516
5600	MSL	100	D5GHzV2-1176-5600	3823	480
5750	MSL	100	D5GHzV2-1176-5750	3823	480

<1g SAR>

Date	Frequency (MHz)	Tissue Type	Input Power (mW)	Measured 1g SAR (W/kg)	Targeted 1g SAR (W/kg)	Normalized 1g SAR (W/kg)	Deviation (%)
2018-10-24	835	HSL	250	2.34	9.34	9.36	0.21
2018-10-25	1750	HSL	250	9.40	37.10	37.6	1.35
2018-11-17	1900	HSL	250	10.25	39.50	41	3.80
2018-12-20	2450	HSL	250	13.23	52.90	52.92	0.04
2018-10-23	2600	HSL	250	14.02	54.00	56.08	3.85
2018-12-20	5250	HSL	100	8.19	78.90	81.9	3.80

2018-12-20	5600	HSL	100	7.96	80.90	79.6	-1.61
2018-12-20	5750	HSL	100	7.93	79.60	79.3	-0.38
2018-10-24	835	MSL	250	2.49	9.61	9.96	3.64
2018-10-23	1750	MSL	250	9.20	37.40	36.8	-1.60
2018-10-24	1900	MSL	250	10.29	39.90	41.16	3.16
2018-12-19	2450	MSL	250	13.60	51.50	54.4	5.63
2018-10-22	2600	MSL	250	13.61	54.00	54.44	0.81
2018-12-19	5250	MSL	100	7.63	72.70	76.3	4.95
2018-12-19	5600	MSL	100	8.15	77.30	81.5	5.43
2018-12-19	5750	MSL	100	7.82	75.30	78.2	3.85

<10g SAR>

Date	Frequency (MHz)	Tissue Type	Input Power (mW)	Measured 10g SAR (W/kg)	Targeted 10g SAR (W/kg)	Normalized 10g SAR (W/kg)4	Deviation (%)
2018-10-24	835	HSL	250	1.59	6.07	6.36	4.78
2018-10-25	1750	HSL	250	5.08	20.00	20.32	1.60
2018-11-17	1900	HSL	250	5.36	20.60	21.44	4.08
2018-12-20	2450	HSL	250	6.30	24.90	25.2	1.20
2018-10-23	2600	HSL	250	6.23	24.50	24.92	1.71
2018-12-20	5250	HSL	100	2.21	22.50	22.1	-1.78
2018-12-20	5600	HSL	100	2.20	23.10	22	-4.76
2018-12-20	5750	HSL	100	2.19	22.90	21.9	-4.37
2018-10-24	835	MSL	250	1.58	6.31	6.32	0.16
2018-10-23	1750	MSL	250	5.15	19.90	20.6	3.52
2018-10-24	1900	MSL	250	5.29	20.70	21.16	2.22
2018-12-19	2450	MSL	250	6.27	23.80	25.08	5.38
2018-10-22	2600	MSL	250	6.20	24.20	24.8	2.48
2018-12-19	5250	MSL	100	2.13	20.60	21.3	3.40
2018-12-19	5600	MSL	100	2.23	21.80	22.3	2.29
2018-12-19	5750	MSL	100	2.21	21.10	22.1	4.74

Note: System checks the specific test data please see Annex C

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9. EUT Testing Position

This EUT was tested in six different positions. They are right cheek/right tilted/left cheek/left tilted for head, Front/Back of the EUT with phantom 10 mm gap, as illustrated below, please refer to Appendix B for the test setup photos.

9.1. Handset Reference Points

The vertical centre line passes through two points on the front side of the handset – the midpoint of the width w_t of the handset at the level of the acoustic output, and the midpoint of the width w_b of the bottom of the handset.

The horizontal line is perpendicular to the vertical centre line and passes the center of the acoustic output. The horizontal line is also tangential to the handset at point A.

The two lines intersect at point A. Note that for many handsets, point A coincides with the center of the acoustic output; however, the acoustic output may be located elsewhere on the horizontal line. Also note that the vertical centre line is not necessarily parallel to the front face of the handset, especially for clamshell handsets, handsets with flip covers, and other irregularly shaped handsets.

Fig. 9.1 Illustration for Cheek Position

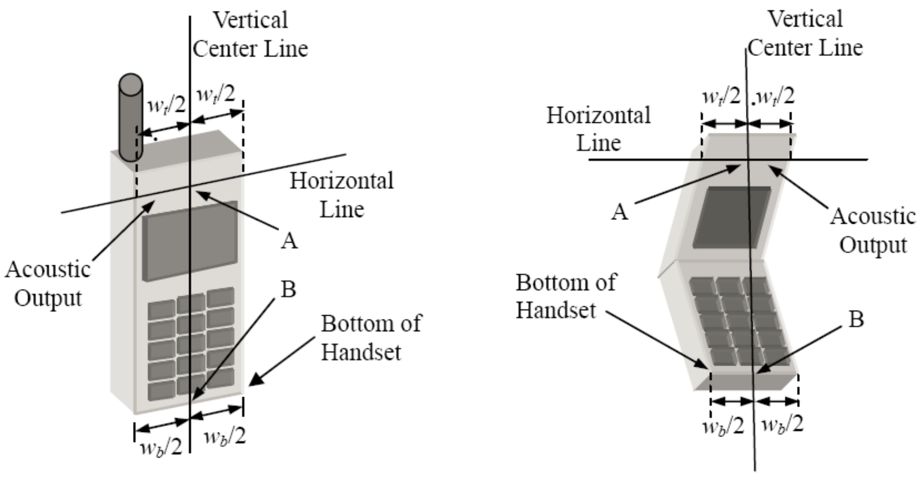

Fig. 9.2 Illustration for Handset Vertical and Horizontal Reference Lines

9.2. Positioning for Cheek / Touch

To position the device with the vertical center line of the body of the device and the horizontal line crossing the center piece in a plane parallel to the sagittal plane of the phantom. While maintaining the device in this plane, align the vertical center line with the reference plane containing the three ear and mouth reference point (M: Mouth, RE: Right Ear and LE: Left Ear) and align the center of the ear piece with the line RE-LE.

To move the device towards the phantom with the ear piece aligned with the line LE-RE until the phone touched the ear. While maintaining the device in the reference plane and maintaining the phone contact with the ear, move the bottom of the phone until any point on the front side is in contact with the cheek of the phantom or until contact with the ear is lost (see below figure)

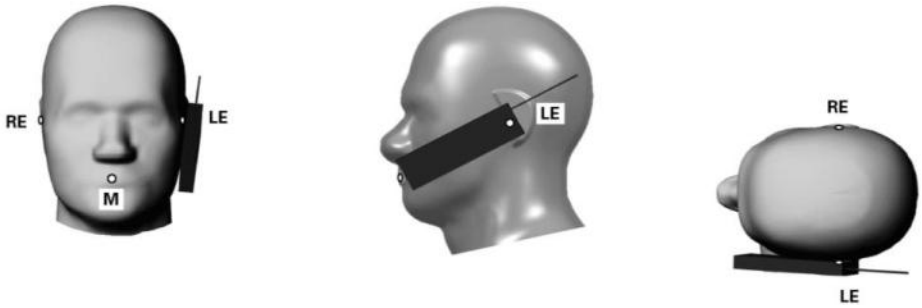

Fig 9.3 Illustration for Cheek Position

9.3. Positioning for Ear / 15º Tilt

To position the device in the “cheek” position described above.

While maintaining the device the reference plane described above and pivoting against the ear, moves it outward away from the mouth by an angle of 15 degrees or until contact with the ear is lost (see figure below).

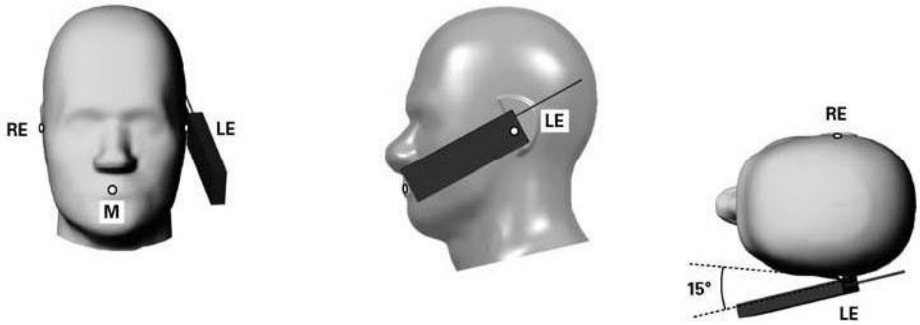

Fig 9.4 Illustration for Tilted Position

9.4. SAR Evaluations near the Mouth/Jaw Regions of the SAM Phantom

Antennas located near the bottom of a phone may require SAR measurements around the mouth and jaw regions of the SAM head phantom. This typically applies to clam-shell style phones that are generally longer in the unfolded normal use positions or to certain older style long rectangular phones.

Under these circumstances, the following procedures apply, adopted from the FCC guidance on SAR handsets document FCC KDB Publication 648474 D04v01r03. The SAR required in these regions of SAM should be measured using a flat phantom. The phone should be positioned with a separation distance of 4 mm between the ear reference point (ERP) and the outer surface of the flat phantom shell. While maintaining this distance at the ERP location, the low (bottom) edge of the phone should be lowered from the phantom to establish the same separation distance between the peak SAR locations identified by the truncated partial SAR distribution measured with the SAM phantom. The distance from the peak SAR location to the phone is determined by the straight line passing perpendicularly through the phantom surface. When it is not feasible to maintain 4 mm separation at the ERP while also establishing the required separation at the peak SAR location, the top edge of the phone will be allowed to touch the phantom with a separation < 4 mm at the ERP. The phone should not be tilted to the left or right while placed in this inclined position to the flat phantom.

9.5. Body-worn Configurations

The body-worn configurations shall be tested with the supplied accessories (belt-clips, holsters, etc.) attached to the device in normal use configuration.

For body-worn and other configurations a flat phantom shall be used which is comprised of material with electrical properties similar to the corresponding tissues.

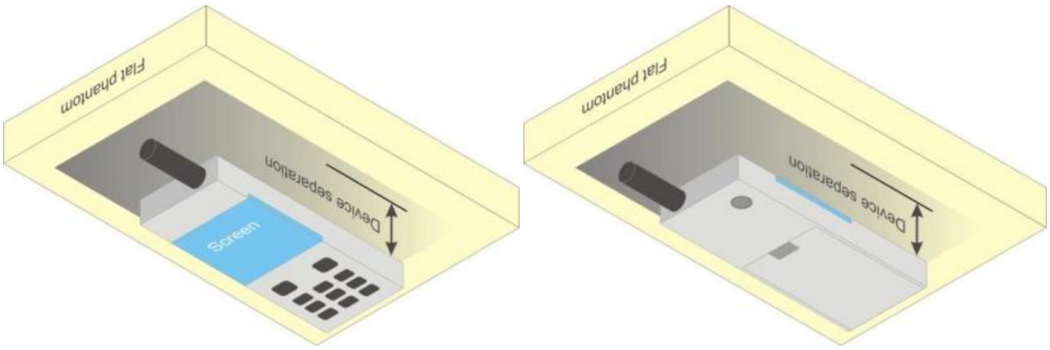

Fig 9.5 Illustration for Body Worn Position

9.6. Hotspot Mode Exposure Position Conditions

For handsets that support hotspot mode operations, with wireless router capabilities and various web browsing functions, the relevant hand and body exposure conditions are tested according to the hotspot SAR procedures in KDB 941225. A test separation distance of 10 mm is required between the phantom and all surfaces and edges with a transmitting antenna located within 25 mm from that surface or edge. When the form factor of a handset is smaller than 9 cm x 5 cm, a test separation distance of 5 mm (instead of 10 mm) is required for testing hotspot mode. When the separation distance required for body-worn accessory testing is larger than or equal to that tested for hotspot mode, in the same wireless mode and for the same surface of the phone, the hotspot mode SAR data may be used to support body-worn accessory SAR compliance for that particular configuration (surface).

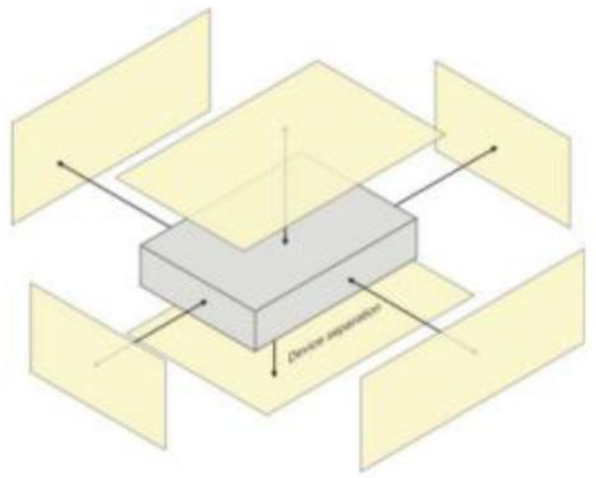

Fig 9.6 Illustration for Hotspot Position

10. Measurement Procedures

The measurement procedures are as follows:

<Conducted power measurement>

(a) For WWAN power measurement, use base station simulator to configure EUT WWAN transmission in conducted connection with RF cable, at maximum power in each supported wireless interface and frequency band.

(b) Read the WWAN RF power level from the base station simulator.

(c) For WLAN/BT power measurement, use engineering software to configure EUT WLAN/BT continuously transmission, at maximum RF power in each supported wireless interface and frequency band

(d) Connect EUT RF port through RF cable to the power meter, and measure WLAN/BT output power

<SAR measurement>

(a) Use base station simulator to configure EUT WWAN transmission in radiated connection, and engineering software to configure EUT WLAN/BT continuously transmission, at maximum RF power, in the highest power channel

(b) Place the EUT in the positions as Appendix D demonstrates.

(c) Set scan area, grid size and other setting on the DASY software.

(d) Measure SAR results for the highest power channel on each testing position.

(e) Find out the largest SAR result on these testing positions of each band

(f)Measure SAR results for other channels in worst SAR testing position if the reported SAR of highest power channel is larger than 0.8 W/kg

According to the test standard, the recommended procedure for assessing the peak spatial-average SAR value consists of the following steps:

(a) Power reference measurement

(b) Area scan

(c) Zoom scan

(d) Power drift measurement

10.1. Spatial Peak SAR Evaluation

The procedure for spatial peak SAR evaluation has been implemented according to the test standard. It can be conducted for 1g and 10g, as well as for user-specific masses. The DASY software includes all numerical procedures necessary to evaluate the spatial peak SAR value. The base for the evaluation is a "cube" measurement. The measured volume must include the 1g and 10g cubes with the highest averaged SAR values. For that purpose, the center of the measured volume is aligned to the interpolated peak SAR value of a previously performed area scan.

The entire evaluation of the spatial peak values is performed within the post-processing engine (SEMCAD). The system always gives the maximum values for the 1g and 10g cubes. The algorithm to find the cube with highest averaged SAR is divided into the following stages:

(a) Extraction of the measured data (grid and values) from the Zoom Scan

(b) Calculation of the SAR value at every measurement point based on all stored data (A/D values and measurement parameters)

(c) Generation of a high-resolution mesh within the measured volume

(d) Interpolation of all measured values form the measurement grid to the high-resolution grid

(e) Extrapolation of the entire 3-D field distribution to the phantom surface over the distance from sensor to surface

(f)Calculation of the averaged SAR within masses of 1g and 10g

10.2. 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. This distance cannot be smaller than the distance of sensor calibration points to probe tip as defined in the probe properties.

10.3. Area Scan Procedures

Area scans are defined prior to the measurement process being executed with a user defined variable spacing between each measurement point (integral) allowing low uncertainty measurements to be conducted. Scans defined for FCC applications utilize a10mm^2 step integral, with 1mm interpolation used to locate the peak SAR area used for zoom scan assessments.

When an Area Scan has measured all reachable points, it computes the field maxima founding the scanned area, within a range of the global maximum. The range (in dB) is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE1528-2003, EN 50361 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan).

10.4. Zoom Scan Procedures

Zoom Scans are used to assess the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of simulated tissue. A density of 1000 kg/m³ is used to represent the head and body tissue density and not the phantom liquid density, in order to be consistent with the definition of the liquid dielectric properties, i.e. the side length of the 1g cube is 10mm, with the side length of the 10 g cube 21,5mm.The zoom scan integer steps can be user defined so as to reduce uncertainty, but normal practice for typical test applications utilize a physical step of 5x5x7 (8mmx8mmx5mm) providing a volume of 32mm in the X & Y axis, and 30mm in the Z axis.

10.5. SAR Averaged Methods

In DASY, the interpolation and extrapolation are both based on the modified Quadratic Sheppard's method. The interpolation scheme combines a least-square fitted function method and a weighted average method which are the two basic types of computational interpolation and approximation.

Extrapolation routines are used to obtain SAR values between the lowest measurement points and the inner phantom surface. The extrapolation distance is determined by the surface detection distance and the probe sensor offset. The uncertainty increases with the extrapolation distance. To keep the uncertainty within 1% for the 1 g and 10 g cubes, the extrapolation distance should not be larger than 5 mm.

10.6. Power Drift Monitoring

All SAR testing is under the DUT install full charged battery and transmit maximum output power. In DASY measurement software, the power reference measurement and power drift measurement procedures are used for monitoring the power drift of DUT during SAR test. Both these procedures measure the field at a specified reference position before and after the SAR testing. The software will calculate the field difference in dB. If the power drift more than 5%, the SAR will be retested.

11. SAR Test Procedure

11.1. General scan Requirements

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

<table>
<tr><td colspan="3"></td><td>$\leq$ 3 GHz</td><td>> 3 GHz</td></tr>
<tr><td colspan="3">Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface</td><td>5 mm ± 1 mm</td><td>$\frac{1}{2} \cdot \delta \cdot \ln(2)$ mm ± 0.5 mm</td></tr>
<tr><td colspan="3">Maximum probe angle from probe axis to phantom surface normal at the measurement location</td><td>30° ± 1°</td><td>20° ± 1°</td></tr>
<tr><td colspan="3" rowspan="2">Maximum area scan spatial resolution: Δx_{Area}, Δy_{Area}</td><td>$\leq$ 2 GHz: $\leq$ 15 mm
2 – 3 GHz: $\leq$ 12 mm</td><td>3 – 4 GHz: $\leq$ 12 mm
4 – 6 GHz: $\leq$ 10 mm</td></tr>
<tr><td colspan="2">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 $\leq$ the corresponding x or y dimension of the test device with at least one measurement point on the test device.</td></tr>
<tr><td colspan="3">Maximum zoom scan spatial resolution: Δx_{Zoom}, Δy_{Zoom}</td><td>$\leq$ 2 GHz: $\leq$ 8 mm
2 – 3 GHz: $\leq$ 5 mm*</td><td>3 – 4 GHz: $\leq$ 5 mm*
4 – 6 GHz: $\leq$ 4 mm*</td></tr>
<tr><td rowspan="3">Maximum zoom scan spatial resolution, normal to phantom surface</td><td colspan="2">uniform grid: $\Delta z_{Zoom}(n)$</td><td>$\leq$ 5 mm</td><td>3 – 4 GHz: $\leq$ 4 mm
4 – 5 GHz: $\leq$ 3 mm
5 – 6 GHz: $\leq$ 2 mm</td></tr>
<tr><td rowspan="2">graded grid</td><td>$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface</td><td>$\leq$ 4 mm</td><td>3 – 4 GHz: $\leq$ 3 mm
4 – 5 GHz: $\leq$ 2.5 mm
5 – 6 GHz: $\leq$ 2 mm</td></tr>
<tr><td>$\Delta z_{Zoom}(n>1)$: between subsequent points</td><td colspan="2">$\leq 1.5 \cdot \Delta z_{Zoom}(n-1)$ mm</td></tr>
<tr><td>Minimum zoom scan volume</td><td colspan="2">x, y, z</td><td>$\geq$ 30 mm</td><td>3 – 4 GHz: $\geq$ 28 mm
4 – 5 GHz: $\geq$ 25 mm
5 – 6 GHz: $\geq$ 22 mm</td></tr>
<tr><td colspan="5">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 $\leq$ 1.4 W/kg, $\leq$ 8 mm, $\leq$ 7 mm and $\leq$ 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.</td></tr>
</table>

11.2. Test procedure

The Following steps are used for each test position

1. Establish a call with the maximum output power with a base station simulator. The connection between the mobile and the base station simulator is established via air interface.
2. Measurement of the local E-field value at a fixed location. This value serves as a reference value for calculating a possible power drift.
3. Measurement of the SAR distribution with a grid of 8 to 16mm * 8 to16 mm and a constant distance to the inner surface of the phantom. Since the sensors cannot directly measure at the inner phantom surface, the values between the sensors and the inner phantom surface are extrapolated. With these values the area of the maximum SAR is calculated by an interpolation scheme.
4. Around this point, a cube of 30 * 30 * 30 mm or 32 * 32 * 32 mm is assessed by measuring 5 or 8 * 5 or 8*4 or 5 mm. With these data, the peak spatial-average SAR value can be calculated.

11.3. Description of interpolation/extrapolation scheme

The local SAR inside the phantom is measured using small dipole sensing elements inside a probe body. The probe tip must not be in contact with the phantom surface in order to minimize measurements errors, but the highest local SAR will occur at the surface of the phantom.

An extrapolation is using to determinate this highest local SAR values. The extrapolation is based on a fourth-order least-square polynomial fit of measured data. The local SAR value is then extrapolated from the liquid surface with a 1mm step.

The measurements have to be performed over a limited time (due to the duration of the battery) so the step of measurement is high. It could vary between 5 and 8 mm. To obtain an accurate assessment of the maximum SAR averaged over 10 grams and 1 gram requires a very fine resolution in the three dimensional scanned data array.

11.4. Wireless Router

Some battery-operated handsets have the capability to transmit and receive user through simultaneous transmission of WIFI simultaneously with a separate licensed transmitter. The FCC has provided guidance in FCC KDB Publication 941225 D06 v02r01 where SAR test considerations for handsets (L x W ≥ 9 cm x 5 cm) are based on a composite test separation distance of 10 from the front, back and edges of the device containing transmitting antennas within 2.5cm of their edges, determined form 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 publication 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.

12. SAR Test Configuration

<GSM Mode>

A summary of these settings are illustrated below:
For GSM850 frequency band, the power control is set to 5 for GSM/GPRS mode (GSMK-CS1) and set to 8 for EDGE mode (MCS5); For GSM1900 frequency band, the power control is set to 0 for GSM/GPRS mode (GSMK-CS1) and set to 2 for EDGE mode (MCS5)

1. Per KDB 447498 D01v06, the maximum output power channel is used for SAR testing and for further SAR test reduction.
2. Per KDB 941225 D01v03r01, SAR test reduction for GSM / GPRS / EDGE modes is determined by the source-based time-averaged output power including tune-up tolerance. The mode with highest specified time-averaged output power should be tested for SAR compliance in the applicable exposure conditions. For modes with the same specified maximum output power and tolerance, the higher number time-slot configuration should be tested. Therefore, the GPRS (4Tx slots) for GSM850/GSM1900 is considered as the primary mode.
3. Other configurations of GSM / GPRS / EDGE are considered as secondary modes.

Timeslot consignations:

Remark:

1. The frame-averaged power is linearly reported the maximum burst averaged power over 8 time slots. The calculated method are shown as below:
   The duty cycle "x" of different time slots as below:
   1 TX slot is 1/8, 2 TX slots is 2/8, 3 TX slots is 3/8 and 4 TX slots is 4/8
   Based on the calculation formula:
   Frame-averaged power = Burst averaged power + 10 1og (x)
   So,
   Frame-averaged power (1 TX slot) = Burst averaged power (1 TX slot)– 9.03
   Frame-averaged power (2 TX slots) = Burst averaged power (2 TX slots)– 6.02
   Frame-averaged power (3 TX slots) = Burst averaged power (3 TX slots)– 4.26
   Frame-averaged power (4 TX slots) = Burst averaged power (4 TX slots) – 3.01
2. CS1 coding scheme was used in GPRS conducted power measurements and SAR testing, MCS5 coding scheme was used in EGPRS conducted power measurements and SAR testing (if necessary).

No. of Slots:	Slot 1	Slot 2	Slot 3	Slot 4
Slot Consignation:	1Up4Down	2Up3Down	3Up2Down	4Up1Down
Duty Cycle:	1:8.3	1:4.15	1:2.77	1:2.08
Correct Factor:	-9.03dB	-6.02dB	-4.26dB	-3.01dB

<WCDMA Mode>

Summary of UMTS conducted power measurement:

1. The 3G SAR test reduction procedure is applied, when the maximum output power and tune-up tolerance specified for production units in a secondary mode is ≤ ¼ dB higher than the primary mode, SAR measurement is not required for the secondary mode.
2. The following tests were conducted according to the test requirements outlines in 3GPP TS 34.121 specification.
3. The procedures in KDB 941225 D01v03r01 are applied for 3GPP Rel. 6 HSPA to configure the device in the required sub-test mode(s) to determine SAR test exclusion.
4. For HSPA+ devices supporting 16 QAM in the uplink, power measurements procedure is according to the configurations in Table C.11.1.4 of 3GPP TS 34.121-1.
5. Per KDB 941225 D01v03r01, RMC 12.2kbps setting is used to evaluate SAR. The maximum output power and tune-up tolerance specified for production units in HSDPA / HSUPA / DC-HSDPA / HSPA+ is ≤ ¼ dB higher than RMC 12.2Kbps or when the highest reported SAR of the RMC12.2Kbps is scaled by the ratio of specified maximum output power and tune-up tolerance of HSDPA / HSUPA / DC-HSDPA / HSPA+ to RMC12.2Kbps and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for HSDPA / HSUPA / DC-HSDPA / HSPA+, and according to the following RF output power, the output power results of the secondary modes (HSDPA / HSUPA / DC-HSDPA / HSPA+) are less than ¼ dB higher than the primary modes; therefore, SAR measurement is not required for HSDPA / HSUPA / DC-HSDPA / HSPA+.
6. A fixed level power reduction is applied for WCDMA Band II when handset open Hotspot mode, the power reduction triggered.

HSDPA Setup Configuration:

Sub-test	β_c	β_d	β_d *(SF)*	β_c/β_d	β_{hs} (1)	CM (dB) (2)
1	2/15	15/15	64	2/15	4/15	0.0
2	12/15 (3)	15/15 (3)	64	12/15 (3)	24/15	1.0
3	15/15	8/15	64	15/8	30/15	1.5
4	15/15	4/15	64	15/4	30/15	1.5

Note 1: Δ_{ACK}, Δ_{NACK} and $\Delta_{CQI} = 8 \Leftrightarrow A_{hs} = \beta_{hs}/\beta_c = 30/15 \Leftrightarrow \beta_{hs} = 30/15 *\beta_c$

Note 2: CM = 1 for β_c/β_d =12/15, β_{hs}/β_c=24/15.

Note 3: For subtest 2 the β_c/β_d ratio of 12/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signaled gain factors for the reference TFC (TF1, TF1) to β_c = 11/15 and β_d = 15/15.

HSUPA Setup Configuration:

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{hs} (1)	β_{ec}	β_{ed}	β_{ed} (SF)	β_{ed} (codes)	CM(2) (dB)	MPR (dB)	AG(4) Index	E-TFCI
1	11/15(3)	15/15(3)	64	11/15(3)	22/15	209/225	1039/225	4	1	1.0	0.0	20	75
2	6/15	15/15	64	6/15	12/15	12/15	94/75	4	1	3.0	2.0	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	2/15	56/75	4	1	3.0	2.0	17	71
5	15/15(4)	15/15(4)	64	15/15(4)	30/15	24/15	134/15	4	1	1.0	0.0	21	81

Note 1: Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 8 ⇔ $A_{hs} = \beta_{hs}/\beta_c$ = 30/15 ⇔ β_{hs}= 30/15 *β_c.
Note 2: CM = 1 for β_c/β_d =12/15, β_{hs}/β_c=24/15. For all other combinations of DPDCH, DPCCH, HS- DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference.
Note 3: For subtest 1 the β_c/β_d ratio of 11/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signaled gain factors for the reference TFC (TF1, TF1) to β_c = 10/15 and β_d = 15/15.
Note 4: For subtest 5 the β_c/β_d ratio of 15/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signaled gain factors for the reference TFC (TF1, TF1) to β_c = 14/15 and β_d = 15/15.
Note 5: Testing UE using E-DPDCH Physical Layer category 1 Sub-test 3 is not required according to TS 25.306 Table 5.1g.
Note 6: β_{ed} cannot be set directly; it is set by Absolute Grant Value.

HSPA+ 3GPP release 7 (uplink category 7) 16QAM, Setup Configuration:

Table C.11.1.4: β values for transmitter characteristics tests with HS-DPCCH and E-DCH with 16QAM

Sub-test	β_c (Note3)	β_d	β_{HS} (Note1)	β_{ec}	β_{ed} (2xSF2) (Note 4)	β_{ed} (2xSF4) (Note 4)	CM (dB) (Note 2)	MPR (dB) (Note 2)	AG Index (Note 4)	E-TFCI (Note 5)	E-TFCI (boost)
1	1	0	30/15	30/15	β_{ed}1: 30/15 β_{ed}2: 30/15	β_{ed}3: 24/15 β_{ed}4: 24/15	3.5	2.5	14	105	105

Note 1: Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 30/15 with $\beta_{hs} = 30/15 * \beta_c$.
Note 2: CM = 3.5 and the MPR is based on the relative CM difference, MPR = MAX(CM-1,0).
Note 3: DPDCH is not configured, therefore the β_c is set to 1 and β_d = 0 by default.
Note 4: β_{ed} can not be set directly; it is set by Absolute Grant Value.
Note 5: All the sub-tests require the UE to transmit 2SF2+2SF4 16QAM EDCH and they apply for UE using E-DPDCH category 7. E-DCH TTI is set to 2ms TTI and E-DCH table index = 2. To support these E-DCH configurations DPDCH is not allocated. The UE is signaled to use the extrapolation algorithm.

<LTE Mode>

LTE Target MPR level

The device implements maximum power reduction per 3GPP 36.101 requirements where the MPR target is as below table. The MPR settings are implemented configured into firmware and cannot be disabled by the end user or LTE carrier network.

Modulation	Channel bandwidth / Transmission bandwidth configuration [RB]						MPR Target (dB)	3GPP MPR (dB)
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz		
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	1	≤ 1
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	1	≤ 1
16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	2	≤ 2

Note: The measurement result showed some difference from the target MPR level, due to expected 0.5dB measurement tolerance

LTE Bands

LTE Bands	Channel bandwidth / Transmission bandwidth configuration [RB]					
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz
4	v	v	v	v	v	v
5	v	v	v	v	N/A	N/A
7	N/A	N/A	v	v	v	v
17	N/A	N/A	v	v	N/A	N/A

Note:

1. Per KDB 941225 D05v02r05, when a properly configured base station simulator is used for the SAR and power measurements, spectrum plots for each RB allocation and offset configuration is not required.
2. Per KDB 941225 D05v02r05, start with the largest channel bandwidth and measure SAR for QPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power for RB offsets at the upper edge, middle and lower edge of each required test channel.
3. Per KDB 941225 D05v02r05, 50% RB allocation for QPSK SAR testing follows 1RB QPSK allocation procedure.
4. Per KDB 941225 D05v02r05, 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 are ≤ 0.8 W/kg. Otherwise, SAR is measured for the highest output power channel; and if the reported SAR is > 1.45 W/kg, the remaining required test channels must also be tested.
5. Per KDB 941225 D05v02r05, 16QAM/64QAM output power for each RB allocation configuration is > not ½ dB higher than the same configuration in QPSK and the reported SAR for the QPSK configuration is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, 16QAM/64QAM SAR testing is not required.
6. Per KDB 941225 D05v02r05, smaller bandwidth output power for each RB allocation configuration is > not ½ Db higher than the same configuration in the largest supported bandwidth, and the reported SAR for the largest supported bandwidth is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, smaller bandwidth SAR testing is not required.
7. For LTE B4 / B5 / B7 / B17 the maximum bandwidth does not support three non-overlapping channels, per KDB 941225 D05v02r05, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.
8. LTE band 17 / 12 SAR test was covered by Band 12 / 25; according to April 2015 TCB workshop, SAR test for overlapping LTE bands can be reduced if
   a. the maximum output power, including tolerance, for the smaller band is ≤ the larger band to

qualify for the SAR test exclusion.

b. the channel bandwidth and other operating parameters for the smaller band are fully supported by the larger band.

9. According to 2017 TCB workshop, for 64 QAM and 16 QAM should be verified by checking the signal constellation with a call box to avoid incorrect maximum power levels due to MPR and other requirements associated with signal modulation, and the following figure is taken from the "Fundamental Measurement >> Modulation Analysis >>constellation" mode of the device connect to the CMW500 base station, therefore, the device 64QAM and 16QAM signal modulation are correct. Identify if Maximum Power Reduction (MPR) is optional or mandatory, i.e. built-in by design: only mandatory MPR may be considered during SAR testing, when the maximum output power is permanently limited by the MPR implemented within the UE; and only for the applicable RB (resource block) configurations specified in LTE standards: b) A-MPR (additional MPR) must be disabled.
10. Per KDB 447498 D01v06, the reported SAR is the measured SAR value adjusted for maximum tune-up tolerance.

    a. Tune-up scaling Factor = tune-up limit power (mW) / EUT RF power (mW), where tune-up limit is the maximum rated power among all production units.

    b. For SAR testing of WLAN signal with non-100% duty cycle, the measured SAR is scaled-up by the duty cycle scaling factor which is equal to "1/(duty cycle)"

    c. For WWAN: Reported SAR(W/kg)= Measured SAR(W/kg)*Tune-up Scaling Factor

    d. For WLAN/Bluetooth: Reported SAR(W/kg)= Measured SAR(W/kg)* Duty Cycle scaling factor * Tune-up scaling factor

    e. For TDD LTE SAR measurement, the duty cycle 1:1.59 (62.9 %) was used perform testing and considering the theoretical duty cycle of 63.3% for extended cyclic prefix in the uplink, and the theoretical duty cycle of 62.9% for normal cyclic prefix in uplink, a scaling factor of extended cyclic prefix 63.3%/62.9% = 1.006 is applied to scale-up the measured SAR result. The Reported TDD LTE SAR = measured SAR (W/kg)* Tune-up Scaling Factor* scaling factor for extended cyclic prefix.
11. Per KDB 447498 D01v06, for each exposure position, testing of other required channels within the operating mode of a frequency band is not required when the reported 1-g or 10-g SAR for the mid-band or highest output power channel is: ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz
12. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥0.8W/kg.
13. Per KDB 648474 D04v01r03, when the reported SAR for a body-worn accessory measured without a headset connected to the handset is ≤ 1.2 W/kg, SAR testing with a headset connected to the handset is not required.

<WLAN 2.4GHz>

1. SAR is measured for 2.4 GHz 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. When any reported SAR is > 1.2 W/kg, SAR is required for the third channel; i.e., all channels require testing.
2. 2.4 GHz 802.11 g/n OFDM are additionally evaluated for SAR if the 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 GHz band, the Initial Test Configuration Procedures should be followed.
3. For held-to-ear and hotspot operations, the initial test position procedures were applied. The test position with the highest extrapolated peak SAR will be 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 was 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.
4. Justification for test configurations for WLAN per KDB Publication 248227 D02DR02-41929 for 2.4 GHz WI-FI single transmission chain operations, the highest measured maximum output power channel for DSSS was selected for SAR measurement. SAR for OFDM modes (2.4 GHz802.11g/n) was not required due to the maximum allowed powers and the highest reported DSSS SAR.
5. A fixed level power reduction is applied for WiFi when handset operates "held to the body" condition or "held to the ear" condition, the power reduction triggered by audio receiver detection and call establish status.

<WLAN 5GHz>

A) U-NII-1 and U-NII-2A Bands

For devices that operate in only one of the U-NII-1 and U-NII-2A bands, the normally required SAR procedures for OFDM configurations are applied. For devices that operate in both U-NII bands using the same transmitter and antenna(s), SAR test reduction is determined according to the following：

1) When the same maximum output power is specified for both bands, begin SAR measurement in U- NII-2A band by applying the OFDM SAR requirements. If the highest reported SAR for a test configuration is ≤ 1.2 W/kg, SAR is not required for U-NII-1 band for that configuration (802.11 mode and exposure condition); otherwise, both bands are tested independently for SAR.

2) When different maximum output power is specified for the bands, begin SAR measurement in the band with higher specified maximum output power. The highest reported SAR for the tested configuration is adjusted by the ratio of lower to higher specified maximum output power for the two bands. When the adjusted SAR is ≤ 1.2 W/kg, SAR is not required for the band with lower maximum output power in that test configuration; otherwise, both bands are tested independently for SAR.

3) The two U-NII bands may be aggregated to support a 160 MHz channel on channel number 50. Without additional testing, the maximum output power for this is limited to the lower of the maximum output power certified for the two bands. When SAR measurement is required for at least one of the bands and the highest reported SAR adjusted by the ratio of specified maximum output power of aggregated to standalone band is > 1.2 W/kg, SAR is required for the 160 MHz channel. This procedure does not apply to an aggregated band with maximum output higher than the standalone band(s); the aggregated band must be tested independently for SAR. SAR is not required when the 160 MHz channel is operating at a reduced maximum power and also qualifies for SAR test exclusion.

B) U-NII-2C and U-NII-3 Bands

The frequency range covered by these bands is 380 MHz (5.47 – 5.85 GHz), which requires a minimum of at least two SAR probe calibration frequency points to support SAR measurements. when Terminal Doppler Weather Radar (TDWR) restriction applies, all channels that operate at 5.60 – 5.65 GHz must be included to apply the SAR test reduction and measurement procedures. When the same transmitter and antenna(s) are used for U-NII-2C band and U-NII-3 band or 5.8 GHz band of §15.247, the bands may be aggregated to enable additional channels with 20, 40 or 80 MHz bandwidth to span across the band gap, as illustrated in Appendix B. The maximum output power for the additional band gap channels is limited to the lower of those certified for the bands. Unless band gap channels are permanently disabled, they must be considered for SAR testing. The frequency range covered by these bands is 380 MHz (5.47 – 5.85 GHz), which requires a minimum of at least two SAR probe calibration frequency points to support SAR measurements. To maintain SAR measurement accuracy and to facilitate test reduction, the channels in U-NII-2C band above 5.65 GHz may be grouped with the 5.8 GHz channels in U-NII-3 or §15.247 band to enable two SAR probe calibration frequency points to cover the bands, including the band gap channels. When band gap channels are supported and the bands are not aggregated for SAR testing, band gap channels must be considered independently in each band according to the normally required OFDM SAR measurement and probe calibration frequency points requirements.

C) OFDM Transmission Mode SAR Test Configuration and Channel Selection Requirements

The initial test configuration for 5 GHz OFDM transmission modes is determined by the 802.11 configuration with the highest maximum output power specified for production units, including tune-up tolerance, in each standalone and aggregated frequency band. SAR for the initial test configuration is measured using the highest maximum output power channel determined by the default power measurement procedures. When multiple configurations in a frequency band have the same specified maximum output power, the initial test configuration is determined according to the following steps applied sequentially.

1) The largest channel bandwidth configuration is selected among the multiple configurations with the same specified maximum output power.

2) If multiple configurations have the same specified maximum output power and largest channel bandwidth, the lowest order modulation among the largest channel bandwidth configurations is selected.

3) If multiple configurations have the same specified maximum output power, largest channel bandwidth and lowest order modulation, the lowest data rate configuration among these configurations is selected.

4) When multiple transmission modes (802.11a/g/n/ac) have the same specified maximum output power, largest channel bandwidth, lowest order modulation and lowest data rate, the lowest order 802.11 mode is selected; i.e., 802.11a is chosen over 802.11n then 802.11ac or 802.11g is chosen over 802.11n. After an initial test configuration is determined, if multiple test channels have the same measured maximum output power, the channel chosen for SAR measurement is determined according to the following. These channel selection procedures apply to both the initial test configuration and subsequent test configuration(s), with respect to the default power measurement procedures or additional power measurements required for further SAR test reduction. The same procedures also apply to subsequent highest output power channel(s) selection.

1) The channel closest to mid-band frequency is selected for SAR measurement.

2) For channels with equal separation from mid-band frequency; for example, high and low channels or two mid-band channels, the higher frequency (number) channel is selected for SAR measurement.

D) SAR Test Requirements for OFDM configurations

When SAR measurement is required for 802.11 a/n/ac OFDM configurations, each standalone and frequency aggregated band is considered separately for SAR test reduction. When the same transmitter and antenna(s) are used for U-NII-1 and U-NII-2A bands, additional SAR test reduction Vapplies. When band gap channels between U-NII-2C band and 5.8 GHz U-NII-3 or §15.247 band are supported, the highest maximum output power transmission mode configuration and maximum output power channel across the bands must be used to determine SAR test reduction, according to the initial test configuration and subsequent test configuration requirements. In applying the initial test configuration and subsequent test configuration procedures, the 802.11 transmission configuration with the highest specified maximum output power and the channel within a test configuration with the highest measured maximum output power should be clearly distinguished to apply the procedures.

13. Conducted RF Output Power

13.1. GSM Conducted Power

GSM850	Burst Average Power (dBm)			Tune-up	Frame-Average Power (dBm)			Tune-up
TX Channel	128	190	251	Limit	128	190	251	Limit
Frequency (MHz)	824.2	836.6	848.8	(dBm)	824.2	836.6	848.8	(dBm)
GSM 1 Tx slot	31.92	31.90	32.18	32.50	22.92	22.90	23.18	23.50
GPRS 1 Tx slot	31.98	31.90	32.19	32.50	22.98	22.90	23.19	23.50
GPRS 2 Tx slots	29.21	29.18	29.23	29.50	23.21	23.18	23.23	23.50
GPRS 3 Tx slots	27.47	27.56	27.58	28.00	23.21	23.30	23.32	23.74
GPRS 4 Tx slots	25.90	25.93	25.84	26.50	22.90	22.93	22.84	23.50
EDGE 1 Tx slot	26.78	26.81	26.80	27.50	17.78	17.81	17.80	18.50
EDGE 2 Tx slots	26.17	26.18	26.17	26.50	20.17	20.18	20.17	20.50
EDGE 3 Tx slots	23.52	23.54	23.51	24.00	19.26	19.28	19.25	19.74
EDGE 4 Tx slots	21.88	21.88	22.03	22.50	18.88	18.88	19.03	19.50

GSM1900	Burst Average Power (dBm)			Tune-up	Frame-Average Power (dBm)			Tune-up
TX Channel	512	661	810	Limit	512	661	810	Limit
Frequency (MHz)	1850.2	1880	1909.8	(dBm)	1850.2	1880	1909.8	(dBm)
GSM 1 Tx slot	29.38	29.47	29.35	30.00	20.38	20.47	20.35	21.00
GPRS 1 Tx slot	29.36	29.46	29.38	30.00	20.36	20.46	20.38	21.00
GPRS 2 Tx slots	26.91	27.00	26.95	27.50	20.91	21.00	20.95	21.50
GPRS 3 Tx slots	25.94	25.92	25.95	26.50	21.68	21.66	21.69	22.24
GPRS 4 Tx slots	24.60	24.56	24.52	25.00	21.60	21.56	21.52	22.00
EDGE 1 Tx slot	24.66	24.71	24.65	25.00	15.66	15.71	15.65	16.00
EDGE 2 Tx slots	24.48	24.53	24.39	25.00	18.48	18.53	18.39	19.00
EDGE 3 Tx slots	21.60	21.64	21.61	23.00	17.34	17.38	17.35	18.74
EDGE 4 Tx slots	19.27	19.30	19.25	20.00	16.27	16.30	16.25	17.00

Timeslot consignations:

No. of Slots	**Slot 1**	**Slot 2**	**Slot 3**	**Slot 4**
Slot Consignation	1Up4Down	2Up3Down	3Up2Down	4Up1Down
Duty Cycle	1:8.3	1:4.15	1:2.77	1:2.08
Correct Factor	-9.03dB	-6.02dB	-4.26dB	-3.01dB

13.2. WCDMA Conducted Power

Band	WCDMA II			Tune-up Limit (dBm)	WCDMA V			Tune-up Limit (dBm)
TX Channel	9262	9400	9538		4132	4182	4233	
Rx Channel	9662	9800	9938		4357	4407	4458	
Frequency (MHz)	1852.4	1880	1907.6		826.4	836.4	846.6	
AMR 12.2Kbps	20.80	20.71	20.73	21.00	23.29	23.18	23.39	24.00
RMC 12.2Kbps	20.82	20.72	20.76	21.00	23.31	23.21	23.48	24.00
HSDPA Subtest-1	20.25	20.15	20.29	20.50	22.30	22.41	22.53	23.00
HSDPA Subtest-2	20.27	20.22	20.37	20.50	22.45	22.52	22.61	23.00
HSDPA Subtest-3	19.82	19.74	19.90	20.00	21.96	21.99	22.13	22.50
HSDPA Subtest-4	19.81	19.72	19.86	20.00	21.94	21.98	22.12	22.50
HSUPA Subtest-1	20.13	20.16	20.33	20.50	22.55	22.53	22.55	23.00
HSUPA Subtest-2	18.25	18.14	18.32	18.50	20.37	20.53	20.54	21.00
HSUPA Subtest-3	19.26	19.13	19.31	19.50	21.51	21.58	21.59	22.00
HSUPA Subtest-4	18.25	18.14	18.31	18.50	20.45	20.49	20.51	21.00
HSUPA Subtest-5	20.11	20.07	20.18	20.50	22.42	22.48	22.51	23.00
HSPA+ (16QAM) Subtest-1	19.12	19.19	19.32	19.50	21.18	21.31	21.27	21.50

13.3. LTE Conducted Power

LTE Band 2

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)
Channel				18700	18900	19100	
Frequency (MHz)				1860	1880	1900	
20	QPSK	1	0	20.68	20.53	20.59	21
20	QPSK	1	49	20.53	20.51	20.42	
20	QPSK	1	99	20.01	20.32	20.64	
20	QPSK	50	0	19.74	19.70	19.65	20
20	QPSK	50	24	19.58	19.57	19.63	
20	QPSK	50	50	19.56	19.56	19.54	
20	QPSK	100	0	19.63	19.59	19.60	
20	16QAM	1	0	19.67	18.93	19.61	20
20	16QAM	1	49	19.44	19.64	19.33	
20	16QAM	1	99	19.40	19.24	19.59	
20	16QAM	50	0	18.46	18.70	18.74	19
20	16QAM	50	24	18.56	18.63	18.58	
20	16QAM	50	50	18.35	18.64	18.65	
20	16QAM	100	0	18.50	18.61	18.57	
Channel				18675	18900	19125	Tune-up limit (dBm)
Frequency (MHz)				1857.5	1880	1902.5	
15	QPSK	1	0	20.15	20.61	20.26	21
15	QPSK	1	37	20.66	20.54	20.61	
15	QPSK	1	74	20.65	20.26	20.03	
15	QPSK	36	0	19.16	19.52	19.58	20
15	QPSK	36	20	19.60	19.46	19.48	
15	QPSK	36	39	19.03	19.60	19.64	
15	QPSK	75	0	19.61	19.59	19.43	
15	16QAM	1	0	19.05	19.38	19.37	20
15	16QAM	1	37	19.55	19.54	19.59	
15	16QAM	1	74	19.59	19.58	19.58	
15	16QAM	36	0	18.79	18.86	18.96	19
15	16QAM	36	20	18.94	18.97	18.99	
15	16QAM	36	39	18.05	18.98	18.02	

15	16QAM	75	0	18.69	18.87	18.90	
Channel				18650	18900	19150	Tune-up limit (dBm)
Frequency (MHz)				1855	1880	1905	
10	QPSK	1	0	20.61	20.56	20.59	21
10	QPSK	1	25	20.65	20.56	20.63	
10	QPSK	1	49	20.51	20.59	20.51	
10	QPSK	25	0	19.62	19.55	19.51	20
10	QPSK	25	12	19.55	19.59	19.66	
10	QPSK	25	25	19.62	19.59	19.64	
10	QPSK	50	0	19.65	19.50	19.50	
10	16QAM	1	0	19.64	19.50	19.51	20
10	16QAM	1	25	19.51	19.54	19.51	
10	16QAM	1	49	19.20	19.50	19.56	
10	16QAM	25	0	18.68	18.81	18.63	19
10	16QAM	25	12	18.55	18.90	18.94	
10	16QAM	25	25	18.58	18.88	18.83	
10	16QAM	50	0	18.51	18.61	18.93	
Channel				18625	18900	19175	Tune-up limit (dBm)
Frequency (MHz)				1852.5	1880	1907.5	
5	QPSK	1	0	20.61	20.46	20.66	21
5	QPSK	1	12	20.25	20.66	20.20	
5	QPSK	1	24	20.60	20.46	20.66	
5	QPSK	12	0	19.61	19.66	19.66	20
5	QPSK	12	7	19.62	19.62	19.60	
5	QPSK	12	13	19.60	19.66	19.65	
5	QPSK	25	0	19.60	19.61	19.60	
5	16QAM	1	0	19.62	19.66	19.53	20
5	16QAM	1	12	19.66	19.56	19.66	
5	16QAM	1	24	19.01	19.42	19.66	
5	16QAM	12	0	18.59	18.63	18.83	19
5	16QAM	12	7	18.72	18.82	18.89	
5	16QAM	12	13	18.71	18.75	18.90	
5	16QAM	25	0	18.82	18.79	18.93	
Channel				18615	18900	19185	Tune-up limit (dBm)
Frequency (MHz)				1851.5	1880	1908.5	

3	QPSK	1	0	20.66	20.54	20.66	21
3	QPSK	1	8	20.56	20.53	20.01	
3	QPSK	1	14	20.51	20.60	20.04	
3	QPSK	8	0	19.55	19.65	19.60	20
3	QPSK	8	4	19.64	19.62	19.58	
3	QPSK	8	7	19.56	19.63	19.63	
3	QPSK	15	0	19.60	19.53	19.63	
3	16QAM	1	0	19.53	19.50	19.63	20
3	16QAM	1	8	19.52	19.54	19.40	
3	16QAM	1	14	19.62	19.56	19.51	
3	16QAM	8	0	18.80	18.54	18.07	19
3	16QAM	8	4	18.76	18.64	18.66	
3	16QAM	8	7	18.07	18.56	18.07	
3	16QAM	15	0	18.76	18.92	18.15	
Channel				18607	18900	19193	Tune-up limit (dBm)
Frequency (MHz)				1850.7	1880	1909.3	
1.4	QPSK	1	0	20.51	20.65	20.04	21
1.4	QPSK	1	3	20.56	20.65	20.63	
1.4	QPSK	1	5	20.50	20.55	20.04	
1.4	QPSK	3	0	20.50	20.50	20.15	
1.4	QPSK	3	1	20.64	20.55	20.26	
1.4	QPSK	3	3	20.56	20.51	20.15	
1.4	QPSK	6	0	19.56	19.54	19.66	20
1.4	16QAM	1	0	19.55	19.66	19.63	20
1.4	16QAM	1	3	19.05	19.65	19.31	
1.4	16QAM	1	5	19.62	19.56	19.53	
1.4	16QAM	3	0	19.56	19.46	19.56	
1.4	16QAM	3	1	19.56	19.55	19.66	
1.4	16QAM	3	3	19.56	19.52	19.61	
1.4	16QAM	6	0	18.55	18.59	18.59	19

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LTE Band 4

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)
Channel				20050	20175	20300	
Frequency (MHz)				1720	1732.5	1745	
20	QPSK	1	0	21.86	22.02	22.32	22.5
20	QPSK	1	49	21.86	21.86	21.98	
20	QPSK	1	99	21.79	21.87	21.82	
20	QPSK	50	0	21.82	21.82	22.05	22.5
20	QPSK	50	24	21.68	21.71	21.93	
20	QPSK	50	50	21.92	21.98	22.26	
20	QPSK	100	0	20.87	20.79	20.94	21
20	16QAM	1	0	21.16	20.89	20.53	21.5
20	16QAM	1	49	21.30	21.34	20.70	
20	16QAM	1	99	21.20	21.16	20.58	
20	16QAM	50	0	20.87	21.04	21.21	21.5
20	16QAM	50	24	20.82	21.08	21.25	
20	16QAM	50	50	20.78	20.97	21.14	
20	16QAM	100	0	19.73	19.82	20.13	
Channel				20025	20175	20325	Tune-up limit (dBm)
Frequency (MHz)				1717.5	1732.5	1747.5	
15	QPSK	1	0	21.63	21.64	21.64	22.5
15	QPSK	1	37	21.72	21.81	21.89	
15	QPSK	1	74	21.34	21.52	21.74	
15	QPSK	36	0	20.56	20.77	20.59	21.5
15	QPSK	36	20	20.6	20.77	20.56	
15	QPSK	36	39	20.64	20.68	20.55	
15	QPSK	75	0	20.51	20.61	20.54	
15	16QAM	1	0	20.42	20.48	20.41	21.5
15	16QAM	1	37	20.68	20.63	20.37	
15	16QAM	1	74	20.21	20.21	20.87	
15	16QAM	36	0	19.57	19.71	19.61	20.5
15	16QAM	36	20	19.69	19.73	19.72	
15	16QAM	36	39	19.58	19.78	19.68	
15	16QAM	75	0	19.65	19.75	19.72	
Channel				20000	20175	20350	Tune-up

Frequency (MHz)				1715	1732.5	1750	limit (dBm)
10	QPSK	1	0	21.67	21.97	21.67	22.5
10	QPSK	1	25	21.97	21.8	21.71	
10	QPSK	1	49	21.72	22.07	21.86	
10	QPSK	25	0	20.86	20.75	20.82	21.5
10	QPSK	25	12	20.8	20.78	20.78	
10	QPSK	25	25	20.89	20.78	21	
10	QPSK	50	0	20.83	20.8	20.85	
10	16QAM	1	0	20.46	21.49	20.25	21.5
10	16QAM	1	25	20.88	20.76	20.66	
10	16QAM	1	49	20.85	20.72	20.86	
10	16QAM	25	0	19.81	19.8	19.87	20.5
10	16QAM	25	12	19.74	19.72	19.92	
10	16QAM	25	25	19.84	19.77	20.06	
10	16QAM	50	0	19.62	19.76	20.01	
Channel				19975	20175	20375	Tune-up limit (dBm)
Frequency (MHz)				1712.5	1732.5	1752.5	
5	QPSK	1	0	21.39	21.28	21.24	22.5
5	QPSK	1	12	21.81	21.71	21.70	
5	QPSK	1	24	21.22	21.53	21.59	
5	QPSK	12	0	20.47	20.65	20.58	21.5
5	QPSK	12	7	20.51	20.75	20.57	
5	QPSK	12	13	20.56	20.73	20.55	
5	QPSK	25	0	20.60	20.73	20.57	
5	16QAM	1	0	20.00	20.32	20.54	21.5
5	16QAM	1	12	20.54	20.10	20.66	
5	16QAM	1	24	19.85	20.54	20.18	
5	16QAM	12	0	19.53	19.65	19.72	20.5
5	16QAM	12	7	19.58	19.72	19.90	
5	16QAM	12	13	19.56	19.87	19.71	
5	16QAM	25	0	19.55	19.61	19.68	
Channel				19965	20175	20385	Tune-up limit (dBm)
Frequency (MHz)				1711.5	1732.5	1753.5	
3	QPSK	1	0	22.07	21.73	22.08	22.5
3	QPSK	1	8	21.80	21.73	21.67	

3	QPSK	1	14	21.95	22.00	21.71	
3	QPSK	8	0	20.77	20.86	20.88	21.5
3	QPSK	8	4	20.96	20.80	20.85	
3	QPSK	8	7	20.90	20.82	20.88	
3	QPSK	15	0	20.86	20.71	20.95	
3	16QAM	1	0	20.58	20.48	20.71	21.5
3	16QAM	1	8	20.52	20.47	20.50	
3	16QAM	1	14	20.62	20.69	20.84	
3	16QAM	8	0	19.71	19.88	20.08	20.5
3	16QAM	8	4	20.29	19.62	19.97	
3	16QAM	8	7	19.77	19.86	20.02	
3	16QAM	15	0	19.81	19.59	20.01	
Channel				19957	20175	20393	Tune-up limit (dBm)
Frequency (MHz)				1710.7	1732.5	1754.3	
1.4	QPSK	1	0	21.38	21.27	21.66	22.5
1.4	QPSK	1	3	21.34	21.67	22.14	
1.4	QPSK	1	5	21.19	21.3	21.63	
1.4	QPSK	3	0	20.62	20.73	20.71	
1.4	QPSK	3	1	20.56	20.77	20.46	
1.4	QPSK	3	3	20.59	20.61	20.58	
1.4	QPSK	6	0	20.6	20.58	20.6	21.5
1.4	16QAM	1	0	20.34	20.77	20.79	21.5
1.4	16QAM	1	3	20.1	20.26	20.65	
1.4	16QAM	1	5	20.47	20.34	20.63	
1.4	16QAM	3	0	19.62	19.62	19.83	
1.4	16QAM	3	1	19.72	19.75	19.63	
1.4	16QAM	3	3	19.6	19.63	19.73	
1.4	16QAM	6	0	19.64	19.66	19.73	20.5

LTE Band 5

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)
Channel				20450	20525	20600	
Frequency (MHz)				829	836.5	844	
10	QPSK	1	0	21.52	21.40	21.65	22
10	QPSK	1	25	21.43	21.16	21.56	
10	QPSK	1	49	21.31	21.11	21.59	
10	QPSK	25	0	20.39	20.48	20.58	21
10	QPSK	25	12	20.5	20.49	20.46	
10	QPSK	25	25	20.47	20.41	20.52	
10	QPSK	50	0	20.58	20.46	20.38	
10	16QAM	1	0	20.2	20.48	20.46	21
10	16QAM	1	25	20.52	19.9	20.39	
10	16QAM	1	49	20.03	20.16	20.36	
10	16QAM	25	0	19.41	19.2	19.37	20
10	16QAM	25	12	19.42	19.51	19.42	
10	16QAM	25	25	19.4	19.5	19.62	
10	16QAM	50	0	19.49	19.28	19.7	
Channel				20425	20525	20625	Tune-up limit (dBm)
Frequency (MHz)				826.5	836.5	846.5	
5	QPSK	1	0	21.32	21.13	21.25	22
5	QPSK	1	12	21.42	21.36	21.52	
5	QPSK	1	24	21.31	21.11	21.59	
5	QPSK	12	0	20.25	20.45	20.40	21
5	QPSK	12	7	20.50	20.49	20.46	
5	QPSK	12	13	20.45	20.43	20.52	
5	QPSK	25	0	20.58	20.46	20.38	
5	16QAM	1	0	20.20	20.41	20.42	21
5	16QAM	1	12	20.52	19.90	20.39	
5	16QAM	1	24	20.03	20.26	20.33	
5	16QAM	12	0	19.41	19.29	19.30	20
5	16QAM	12	7	19.49	19.52	19.45	
5	16QAM	12	13	19.48	19.50	19.62	
5	16QAM	25	0	19.69	19.38	19.80	
Channel				20415	20525	20635	Tune-up

Frequency (MHz)				825.5	836.5	847.5	limit (dBm)
3	QPSK	1	0	21.40	21.39	21.44	22
3	QPSK	1	8	21.21	21.06	21.41	
3	QPSK	1	14	21.52	21.10	21.51	
3	QPSK	8	0	20.43	20.43	20.48	21
3	QPSK	8	4	20.43	20.47	20.61	
3	QPSK	8	7	20.40	20.46	20.65	
3	QPSK	15	0	20.42	20.48	20.47	
3	16QAM	1	0	20.57	20.37	20.62	21
3	16QAM	1	8	20.03	20.62	20.49	
3	16QAM	1	14	20.18	20.26	20.31	
3	16QAM	8	0	19.45	19.45	19.18	20
3	16QAM	8	4	19.46	19.34	19.55	
3	16QAM	8	7	19.40	19.50	19.40	
3	16QAM	15	0	19.38	19.06	19.31	
Channel				20407	20525	20643	Tune-up limit (dBm)
Frequency (MHz)				824.7	836.5	848.3	
1.4	QPSK	1	0	21.24	21.29	21.56	22
1.4	QPSK	1	3	21.40	21.55	21.59	
1.4	QPSK	1	5	21.34	21.42	21.43	
1.4	QPSK	3	0	21.38	21.53	21.61	
1.4	QPSK	3	1	21.59	21.50	21.56	
1.4	QPSK	3	3	21.14	21.32	21.24	
1.4	QPSK	6	0	20.37	20.37	20.51	21
1.4	16QAM	1	0	20.30	20.36	20.44	21
1.4	16QAM	1	3	20.46	20.29	20.78	
1.4	16QAM	1	5	20.39	20.12	20.62	
1.4	16QAM	3	0	20.28	20.32	20.51	
1.4	16QAM	3	1	20.42	20.47	20.42	
1.4	16QAM	3	3	20.25	20.37	20.38	
1.4	16QAM	6	0	19.51	19.34	19.54	20

LTE Band 7

BW [MHz]	Modulation	RB Size	RB Offset	Measured Power			Tune-up limit (dBm)
Channel				20850	21100	21350	
Frequency (MHz)				2510	2535	2560	
20	QPSK	1	0	22.13	21.85	21.68	22.5
20	QPSK	1	49	22.11	21.6	22.04	
20	QPSK	1	99	21.73	21.38	21.44	
20	QPSK	50	0	20.82	20.75	20.72	21.5
20	QPSK	50	24	20.81	20.78	20.78	
20	QPSK	50	50	20.64	20.73	20.53	
20	QPSK	100	0	20.67	20.79	20.73	
20	16QAM	1	0	20.54	20.26	20.27	21.5
20	16QAM	1	49	20.42	20.45	20.21	
20	16QAM	1	99	20.71	20.71	20.09	
20	16QAM	50	0	19.65	19.6	19.59	20.5
20	16QAM	50	24	19.8	19.69	19.5	
20	16QAM	50	50	19.81	19.81	19.75	
20	16QAM	100	0	19.61	19.64	19.6	
Channel				20825	21100	21375	Tune-up limit (dBm)
Frequency (MHz)				2507.5	2535	2562.5	
15	QPSK	1	0	21.83	21.73	21.85	22.5
15	QPSK	1	37	21.91	21.98	21.9	
15	QPSK	1	74	21.88	21.89	21.73	
15	QPSK	36	0	20.96	20.80	20.74	21.5
15	QPSK	36	20	20.87	20.85	20.75	
15	QPSK	36	39	20.82	20.98	20.70	
15	QPSK	75	0	20.91	20.87	20.84	
15	16QAM	1	0	20.96	20.22	20.39	21.5
15	16QAM	1	37	21.09	20.43	20.93	
15	16QAM	1	74	20.43	20.42	20.30	
15	16QAM	36	0	19.90	19.55	19.78	20.5
15	16QAM	36	20	19.94	19.78	19.51	
15	16QAM	36	39	19.78	19.80	19.79	
15	16QAM	75	0	19.77	19.73	19.81	
Channel				20800	21100	21400	Tune-up limit
Frequency (MHz)				2505	2535	2565	

							(dBm)
10	QPSK	1	0	21.73	21.64	21.83	22.5
10	QPSK	1	25	21.74	21.63	21.64	
10	QPSK	1	49	21.85	21.60	21.44	
10	QPSK	25	0	20.75	20.72	20.64	21.5
10	QPSK	25	12	20.86	20.77	20.64	
10	QPSK	25	25	20.79	20.81	20.69	
10	QPSK	50	0	20.87	20.77	20.63	
10	16QAM	1	0	20.70	20.45	20.40	21.5
10	16QAM	1	25	20.70	20.85	20.59	
10	16QAM	1	49	20.44	20.78	19.99	
10	16QAM	25	0	19.85	19.81	19.71	20.5
10	16QAM	25	12	19.75	19.90	19.77	
10	16QAM	25	25	19.80	19.86	19.72	
10	16QAM	50	0	19.73	19.84	19.62	
Channel				20775	21100	21425	Tune-up limit (dBm)
Frequency (MHz)				2502.5	2535	2567.5	
5	QPSK	1	0	21.62	21.57	21.47	22.5
5	QPSK	1	12	21.87	21.87	21.68	
5	QPSK	1	24	21.76	21.64	21.34	
5	QPSK	12	0	20.67	20.71	20.63	21.5
5	QPSK	12	7	20.84	20.76	20.60	
5	QPSK	12	13	20.84	20.71	20.60	
5	QPSK	25	0	20.83	20.76	20.68	
5	16QAM	1	0	20.19	20.58	20.28	21.5
5	16QAM	1	12	20.67	20.57	20.35	
5	16QAM	1	24	20.40	20.28	20.89	
5	16QAM	12	0	19.68	19.71	19.77	20.5
5	16QAM	12	7	19.83	19.49	19.51	
5	16QAM	12	13	19.68	19.72	19.61	
5	16QAM	25	0	19.93	19.73	19.42	

13.4. WLAN Conducted Power

2.4GHz WLAN:

	Mode	Channel	Frequency (MHz)	Calculated Average power (dBm)	Tune-Up Limit	Duty Cycle %
2.4GHz WLAN	802.11b 1Mbps	CH 1	2412	11.04	11.50	97.50
		CH 6	2437	11.14	11.50	
		CH 11	2462	10.82	11.50	
	802.11g 6Mbps	CH 1	2412	11.82	12.00	86.86
		CH 6	2437	12.19	12.50	
		CH 11	2462	11.87	12.00	
	802.11n-HT20 MCS0	CH 1	2412	11.82	12.00	86.05
		CH 6	2437	12.15	12.50	
		CH 11	2462	12.51	13.00	

Note: The WLAN 2.4G antenna gain is -2.5dBi

5GHz WLAN:

	Mode	Channel	Frequency (MHz)	Calculated Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.2GHz WLAN	802.11a 6Mbps	CH 36	5180	7.78	8.00	87.18
		CH 40	5200	7.00	7.50	
		CH 44	5220	7.70	8.00	
		CH 48	5240	7.56	8.00	
	802.11n-HT20 MCS0	CH 36	5180	7.77	8.00	86.39
		CH 40	5200	7.01	7.50	
		CH 44	5220	7.67	8.00	
		CH 48	5240	7.55	8.00	
	802.11n-HT40 MCS0	CH 38	5190	8.12	8.50	82.99
		CH 46	5230	7.90	8.00	
	802.11ac-VHT20 MCS0	CH 36	5180	7.90	8.00	71.10
		CH 40	5200	7.66	8.00	
		CH 44	5220	7.36	7.50	
		CH 48	5240	6.55	7.00	
	802.11ac-VHT40 MCS0	CH 38	5190	8.13	8.50	70.72
		CH 46	5230	7.89	8.00	

	802.11ac-VHT80 MCS0	CH 42	5210	8.33	8.50	53.05

	Mode	Channel	Frequency (MHz)	Calculated Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.3GHz WLAN	802.11a 6Mbps	CH 52	5260	7.61	8.00	87.18
		CH 56	5280	6.89	7.00	
		CH 60	5300	7.41	7.50	
		CH 64	5320	7.56	8.00	
	802.11n-HT20 MCS0	CH 52	5260	7.58	8.00	86.39
		CH 56	5280	6.89	7.00	
		CH 60	5300	7.38	7.50	
		CH 64	5320	7.54	8.00	
	802.11n-HT40 MCS0	CH 54	5270	7.77	8.00	82.99
		CH 62	5310	7.83	8.00	
	802.11ac-VHT20 MCS0	CH 52	5260	7.54	8.00	71.10
		CH 56	5280	6.69	7.00	
		CH 60	5300	7.25	7.50	
		CH 64	5320	7.42	7.50	
	802.11ac-VHT40 MCS0	CH 54	5270	7.78	8.00	70.72
		CH 62	5310	7.86	8.00	
	802.11ac-VHT80 MCS0	CH 58	5290	7.95	8.00	53.05

	Mode	Channel	Frequency (MHz)	Calculated Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.5GHz WLAN	802.11a 6Mbps	CH 100	5500	7.65	8.00	87.18
		CH 116	5580	7.00	7.50	
		CH 120	5600	7.08	7.50	
		CH 132	5660	7.02	7.50	
		CH 140	5700	6.45	7.00	
		CH 144	5720	7.14	7.50	
	802.11n-HT20 MCS0	CH 100	5500	7.83	8.00	86.39
		CH 116	5580	7.05	7.50	
		CH 120	5600	6.83	7.00	

		CH 132	5660	7.10	7.50	
		CH 140	5700	7.07	7.50	
		CH 144	5720	6.83	8.00	
	802.11n-HT40 MCS0	CH 102	5510	7.87	8.00	82.99
		CH 110	5550	6.41	6.50	
		CH 126	5630	8.06	8.50	
		CH 134	5670	6.29	6.50	
		CH 142	5710	6.58	7.00	
	802.11ac-VHT20 MCS0	CH 100	5500	7.45	7.50	71.10
		CH 116	5580	6.27	6.50	
		CH 120	5600	6.72	7.00	
		CH 132	5660	6.59	7.00	
		CH 140	5700	6.02	6.50	
		CH 144	5720	6.92	7.00	
	802.11ac-VHT40 MCS0	CH 102	5510	7.84	8.00	70.72
		CH 110	5550	6.39	6.50	
		CH 126	5630	7.08	7.50	
		CH 134	5670	5.89	6.00	
		CH 142	5710	8.05	8.50	
	802.11ac-VHT80 MCS0	CH 106	5530	7.72	8.00	53.05
		CH 122	5610	7.46	7.50	
		CH 138	5690	7.87	8.00	

	Mode	Channel	Frequency (MHz)	Calculated Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.8GHz WLAN	802.11a MCS0	CH 149	5745	7.57	8.00	87.18
		CH 157	5785	7.42	7.50	
		CH 165	5825	6.08	6.50	
	802.11n-HT20 MCS0	CH 149	5745	6.79	7.00	86.39
		CH 157	5785	6.48	6.50	
		CH 165	5825	5.69	6.00	
	802.11n-HT40 MCS0	CH 151	5755	7.90	8.00	82.99
		CH 159	5795	7.03	7.50	
	802.11ac-VHT20 MCS0	CH 149	5745	7.42	7.50	71.10
		CH 157	5785	6.93	7.00	
		CH 165	5825	6.07	6.50	

	802.11ac-VHT40 MCS0	CH 151	5755	7.90	8.00	70.72
		CH 159	5795	7.04	7.50	
	802.11ac-VHT80 MCS0	CH 155	5775	8.01	8.50	53.05

Note: The WLAN 5G antenna gain is 2.4dBi

13.5. Bluetooth Conducted Power

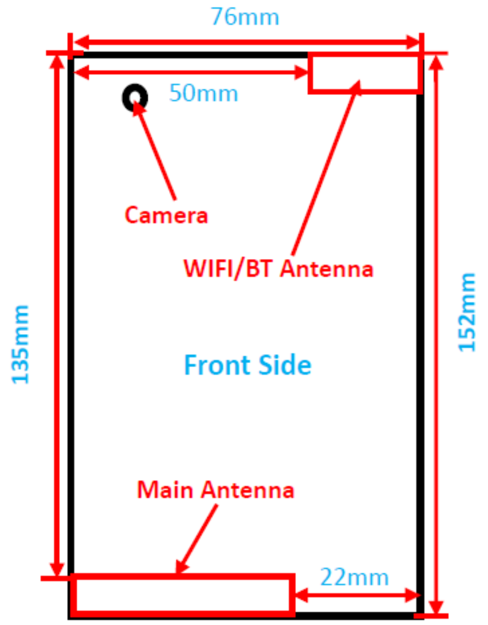
Mode	Channel	Frequency (MHz)	Peak power (dBm)		
			1Mbps	2Mbps	3Mbps
BR / EDR	CH 00	2402	7.99	7.84	8.03
	CH 39	2441	9.41	9.29	9.48
	CH 78	2480	8.17	8.09	8.28
Tune-up Limit			9.5	9.5	9.5

Mode	Channel	Frequency (MHz)	Peak power (dBm)
			GFSK
LE	CH 00	2402	-0.57
	CH 19	2440	0.32
	CH 39	2480	-0.93
Tune-up Limit			1.0

Note: The BT antenna gain is -2.5dBi.

14. Hot-Spot Mode Evaluation Procedure

14.1. EUT Antenna Location



Main antenna supported TX bands :
GSM 850/1900
UMTS Band II/V
LTE Band 2/4/5/7

WIFI antenna supported bands :
2.4GHz/5GHz

BT antenna supported bands:
2.4GHz

Hotspot Evaluation

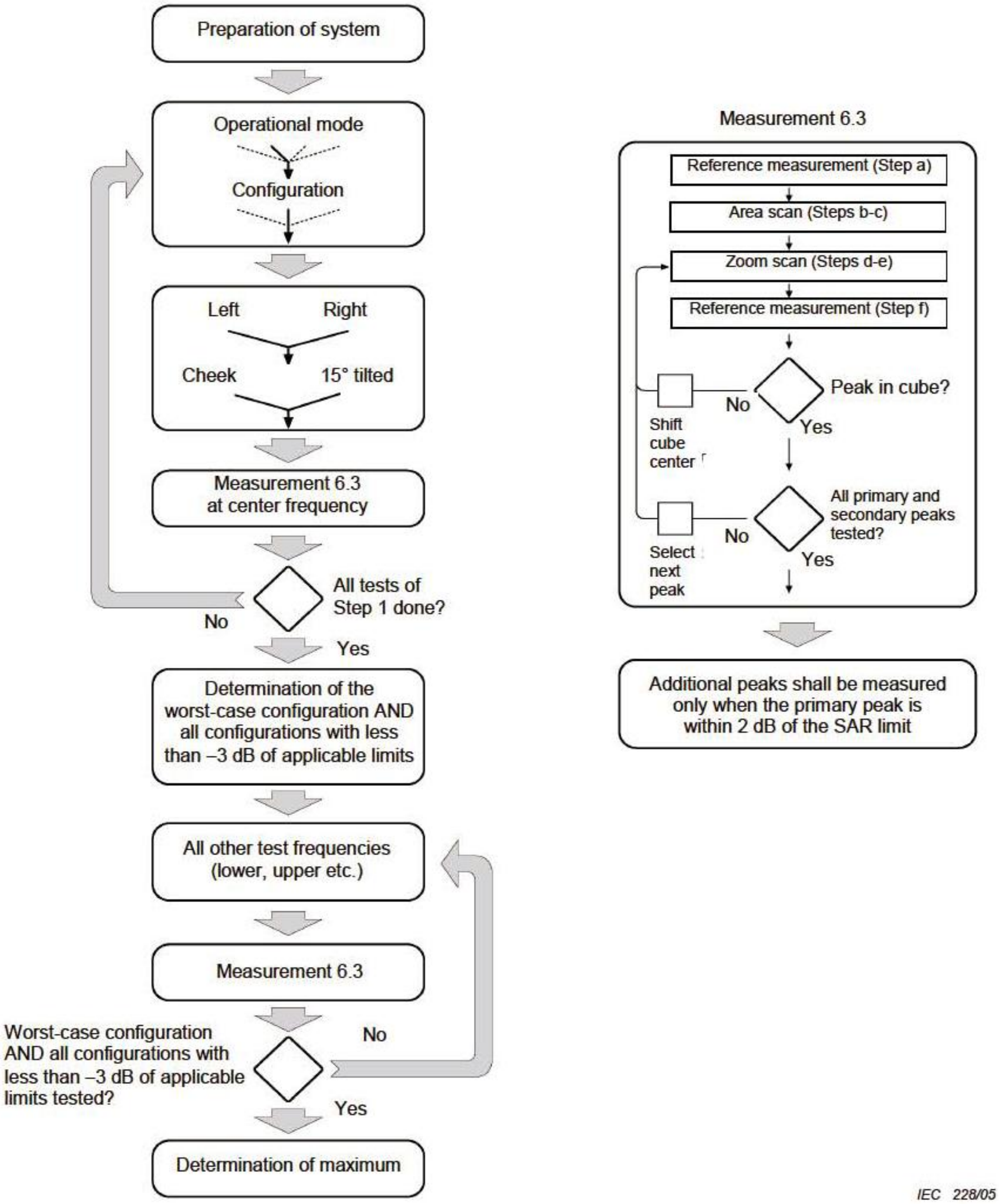
Assessment			**Hotspot side for SAR**			**Test distance: 10mm**
Antennas	**Back**	**Front**	**Top**	**Bottom**	**Left**	**Right**
LTE/WCDMA/GSM	Yes	Yes	No	Yes	Yes	Yes
WLAN&BT	Yes	Yes	Yes	No	No	Yes

Note :

1. The SAR evaluation procedures for Portable Devices with Wireless Router function is according to KDB 941225 D06 Hotspot SAR v02r01.
2. Head/Body-worn/Hotspot mode SAR assessments are required.
3. Referring to KDB 941225 D06, when the overall device length and width are ≥ 9cm*5cm, the test distance is 10 mm. SAR must be measured for all sides and surfaces with a transmitting antenna located within 25mm from that surface or edge.
4. For Main antenna, SAR measurements at Top side are not required since the distance between DUT and flat phantom > 25mm.
5. For WLAN&BT antenna, SAR measurements Bottom side and Right side are not required since the distance between DUT and flat phantom > 25mm.
6. For the Diversity antenna, it supports RX only, SAR is not required.

15. Block diagram of the tests to be performed

15.1. Head



15.2. Body

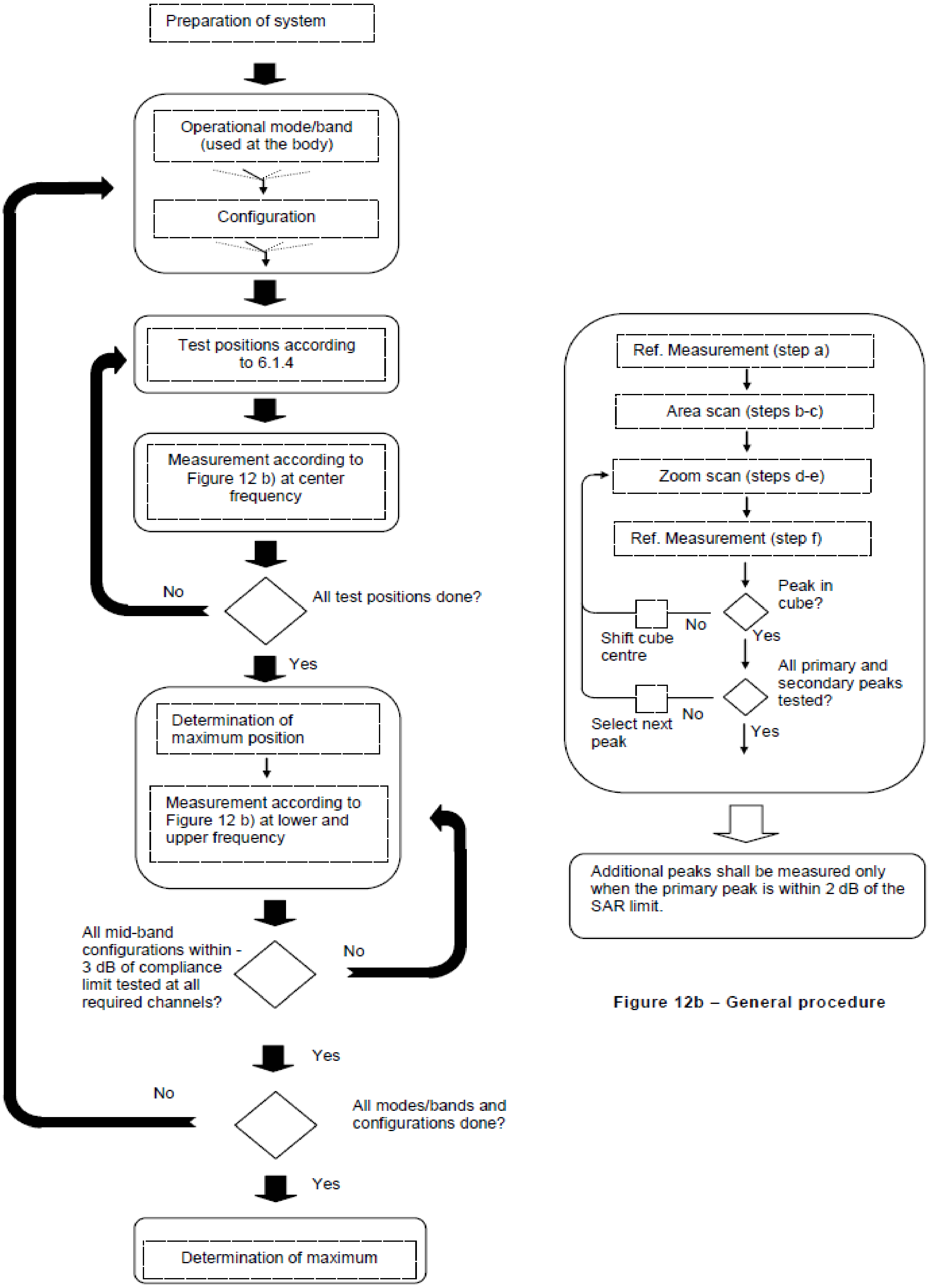


Figure 12b – General procedure

16. Test Results List

16.1. Test Guidance

1. Per KDB 447498 D01v06, the reported SAR is the measured SAR value adjusted for maximum tune-up tolerance.
    a. Tune-up scaling Factor = tune-up limit power (mW) / EUT RF power (mW), where tune-up limit is the maximum rated power among all production units.
    b. For SAR testing of WLAN signal with non-100% duty cycle, the measured SAR is scaled-up by the duty cycle scaling factor which is equal to "1/(duty cycle)"
    c. For WWAN: Reported SAR(W/kg)= Measured SAR(W/kg)*Tune-up Scaling Factor
    d. For WLAN/Bluetooth: Reported SAR(W/kg)= Measured SAR(W/kg)* Duty Cycle scaling factor * Tune-up scaling factor
2. Per KDB 447498 D01v06, for each exposure position, testing of other required channels within the operating mode of a frequency band is not required when the *reported* 1-g or 10-g SAR for the mid-band or highest output power channel is:
    ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
    ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz
    ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz
3. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥0.8W/kg.
4. Per KDB 648474 D04v01r03, when the reported SAR for a body-worn accessory measured without a headset connected to the handset is ≤ 1.2 W/kg, SAR testing with a headset connected to the handset is not required.
5. Per KDB648474 D04v01r03, for smart phones with a display diagonal dimension > 15.0 cm or an overall diagonal dimension > 16.0 cm, when hotspot mode applies, 10-g extremity SAR is required only for the surfaces and edges with hotspot mode 1-g reported SAR > 1.2 W/kg, however, when power reduction applies to hotspot mode the measured SAR must be scaled to the maximum output power, including tolerance, allowed for tablet modes to compare with the 1.2 W/kg SAR test reduction threshold.
6. Per KDB248227 D01v02r02, a Wi-Fi device must be 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 for SAR measurement. The test frequencies

established using test mode must correspond to the actual channel frequencies required for operations in the U.S. 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. In addition, a periodic transmission duty factor is required for current generation SAR systems to measure SAR correctly. Unless it is permitted by specific KDB procedures or continuous transmission is specifically restricted by the device, the reported SAR must be scaled to 100% transmission duty factor to determine compliance at the maximum tune-up tolerance limit. When a device is not capable of sustaining continuous transmission or the output can become nonlinear, and it is limited by hardware design and unable to transmit at higher than 85% duty factor, a periodic duty factor within 15% of the maximum duty factor the device is capable of transmitting should be used. The reported SAR must be scaled to the maximum transmission duty factor to determine compliance. Descriptions of the procedures applied to establish the specific duty factor used for SAR testing are required in SAR reports to support the test results.

7. Per KDB 941225 D06v02r01, the hotspot mode and body-worn mode SAR test distance is 10mm.

16.2. Head SAR Data

<GSM>

Plot No.	Band	Mode	Test Position	Ch.	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	GSM850	GPRS(3 TX slots)	Right Cheek	251	27.58	28.00	1.102	0.127	0.140
	GSM850	GPRS(3 TX slots)	Right Tilt	251	27.58	28.00	1.102	0.063	0.069
1#	GSM850	GPRS(3 TX slots)	Left Cheek	251	27.58	28.00	1.102	0.151	**0.166**
	GSM850	GPRS(3 TX slots)	Left Tilt	251	27.58	28.00	1.102	0.092	0.101
	GSM1900	GPRS(3 TX slots)	Right Cheek	810	25.95	26.50	1.135	0.109	0.124
	GSM1900	GPRS(3 TX slots)	Right Tilt	810	25.95	26.50	1.135	0.005	0.006
2#	GSM1900	GPRS(3 TX slots)	Left Cheek	810	25.95	26.50	1.135	0.399	**0.453**
	GSM1900	GPRS(3 TX slots)	Left Tilt	810	25.95	26.50	1.135	0.085	0.096

<WCDMA>

Plot No.	Band	Mode	Test Position	Ch.	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	WCDMA Band II	RMC 12.2Kbps	Right Cheek	9262	20.82	21.00	1.042	0.196	0.204
	WCDMA Band II	RMC 12.2Kbps	Right Tilt	9262	20.82	21.00	1.042	0.117	0.122
3#	WCDMA Band II	RMC 12.2Kbps	Left Cheek	9262	20.82	21.00	1.042	0.408	**0.425**
	WCDMA Band II	RMC 12.2Kbps	Left Tilt	9262	20.82	21.00	1.042	0.127	0.132
	WCDMA Band V	RMC 12.2Kbps	Right Cheek	4233	23.48	24.00	1.127	0.173	0.195
	WCDMA Band V	RMC 12.2Kbps	Right Tilt	4233	23.48	24.00	1.127	0.102	0.115
4#	WCDMA Band V	RMC 12.2Kbps	Left Cheek	4233	23.48	24.00	1.127	0.184	**0.207**
	WCDMA Band V	RMC 12.2Kbps	Left Tilt	4233	23.48	24.00	1.127	0.102	0.115

<LTE>

Plot No.	Band	BW	Modulation RB/offset	Test Position	Ch.	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	LTE Band 2	20Mhz	QPSK 1RB 0offset	Right Cheek	18700	20.68	21.00	1.076	0.131	0.141
	LTE Band 2	20Mhz	QPSK 1RB 0offset	Right Tilt	18700	20.68	21.00	1.076	0.093	0.101
5#	LTE Band 2	20Mhz	QPSK 1RB 0offset	Left Cheek	18700	20.68	21.00	1.076	0.291	**0.313**
	LTE Band 2	20Mhz	QPSK 1RB 0offset	Left Tilt	18700	20.68	21.00	1.076	0.170	0.176
	LTE Band 2	20Mhz	QPSK 50RB 0offset	Right Cheek	18700	19.74	20.00	1.062	0.109	0.116
	LTE Band 2	20Mhz	QPSK 50RB 0offset	Right Tilt	18700	19.74	20.00	1.062	0.075	0.080
	LTE Band 2	20Mhz	QPSK 50RB 0offset	Left Cheek	18700	19.74	20.00	1.062	0.238	0.253
	LTE Band 2	20Mhz	QPSK 50RB 0offset	Left Tilt	18700	19.74	20.00	1.062	0.089	0.095
	LTE Band 4	20Mhz	QPSK 1RB 0offset	Right Cheek	20300	22.32	22.50	1.042	0.192	0.200
	LTE Band 4	20Mhz	QPSK 1RB 0offset	Right Tilt	20300	22.32	22.50	1.042	0.149	0.155
6#	LTE Band 4	20Mhz	QPSK 1RB 0offset	Left Cheek	20300	22.32	22.50	1.042	0.461	**0.481**
	LTE Band 4	20Mhz	QPSK 1RB 0offset	Left Tilt	20300	22.32	22.50	1.042	0.109	0.114
	LTE Band 4	20Mhz	QPSK 50RB 50offset	Right Cheek	20300	22.26	22.50	1.057	0.153	0.162
	LTE Band 4	20Mhz	QPSK 50RB 50offset	Right Tilt	20300	22.26	22.50	1.057	0.115	0.122
	LTE Band 4	20Mhz	QPSK 50RB 50offset	Left Cheek	20300	22.26	22.50	1.057	0.373	0.394
	LTE Band 4	20Mhz	QPSK 50RB 50offset	Left Tilt	20300	22.26	22.50	1.057	0.085	0.090
	LTE Band 5	10Mhz	QPSK 1RB 0offset	Right Cheek	20600	21.65	22.00	1.084	0.009	0.010
	LTE Band 5	10Mhz	QPSK 1RB 0offset	Right Tilt	20600	21.65	22.00	1.084	0.002	0.002
	LTE Band 5	10Mhz	QPSK 1RB 0offset	Left Cheek	20600	21.65	22.00	1.084	0.034	0.036
	LTE Band 5	10Mhz	QPSK 1RB 0offset	Left Tilt	20600	21.65	22.00	1.084	0.007	0.007
	LTE Band 5	10Mhz	QPSK 25RB 0offset	Right Cheek	20600	20.58	21.00	1.102	0.013	0.014
	LTE Band 5	10Mhz	QPSK 25RB 0offset	Right Tilt	20600	20.58	21.00	1.102	0.002	0.002
7#	LTE Band 5	10Mhz	QPSK 25RB 0offset	Left Cheek	20600	20.58	21.00	1.102	0.068	**0.075**
	LTE Band 5	10Mhz	QPSK 25RB 0offset	Left Tilt	20600	20.58	21.00	1.102	0.016	0.017
	LTE Band 7	20Mhz	QPSK 1RB 0offset	Right Cheek	20850	22.13	22.50	1.089	0.096	0.104
	LTE Band 7	20Mhz	QPSK 1RB 0offset	Right Tilt	20850	22.13	22.50	1.089	0.111	0.121
8#	LTE Band 7	20Mhz	QPSK 1RB 0offset	Left Cheek	20850	22.13	22.50	1.089	0.279	**0.304**

	LTE Band 7	20Mhz	QPSK 1RB 0offset	Left Tilt	20850	22.13	22.50	1.089	0.058	0.063
	LTE Band 7	20Mhz	QPSK 50RB 0offset	Right Cheek	20850	20.82	21.50	1.169	0.076	0.089
	LTE Band 7	20Mhz	QPSK 50RB 0offset	Right Tilt	20850	20.82	21.50	1.169	0.083	0.098
	LTE Band 7	20Mhz	QPSK 50RB 0offset	Left Cheek	20850	20.82	21.50	1.169	0.223	0.261
	LTE Band 7	20Mhz	QPSK 50RB 0offset	Left Tilt	20850	20.82	21.50	1.169	0.045	0.052

< WLAN >

Plot No.	Band	Mode	Test Position	Ch.	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	WLAN2.4GHz	802.11b	Right Cheek	6	11.14	11.50	1.086	97.5	1.026	0.064	0.071
9#	WLAN2.4GHz	802.11b	Right Tilt	6	11.14	11.50	1.086	97.5	1.026	0.080	**0.089**
	WLAN2.4GHz	802.11b	Left Cheek	6	11.14	11.50	1.086	97.5	1.026	0.042	0.047
	WLAN2.4GHz	802.11b	Left Tilt	6	11.14	11.50	1.086	97.5	1.026	0.047	0.052
	WLAN5GHz	802.11a	Right Cheek	36	7.78	8.00	1.052	97.18	1.029	0.023	0.025
	WLAN5GHz	802.11a	Right Tilt	36	7.78	8.00	1.052	97.18	1.029	0.020	0.022
10#	WLAN5GHz	802.11a	Left Cheek	36	7.78	8.00	1.052	97.18	1.029	0.029	**0.031**
	WLAN5GHz	802.11a	Left Tilt	36	7.78	8.00	1.052	97.18	1.029	0.028	0.031
	WLAN5GHz	802.11a	Right Cheek	52	7.61	8.00	1.094	97.18	1.029	0.021	0.024
	WLAN5GHz	802.11a	Right Tilt	52	7.61	8.00	1.094	97.18	1.029	0.019	0.021
11#	WLAN5GHz	802.11a	Left Cheek	52	7.61	8.00	1.094	97.18	1.029	0.028	**0.032**
	WLAN5GHz	802.11a	Left Tilt	52	7.61	8.00	1.094	97.18	1.029	0.024	0.027
	WLAN5GHz	802.11n-HT20 MCS0	Right Cheek	100	7.82	8.00	1.042	86.39	1.158	0.022	0.027
	WLAN5GHz	802.11n-HT20 MCS0	Right Tilt	100	7.82	8.00	1.042	86.39	1.158	0.060	0.072
12#	WLAN5GHz	802.11n-HT20 MCS0	Left Cheek	100	7.82	8.00	1.042	86.39	1.158	0.026	**0.032**
	WLAN5GHz	802.11n-HT20 MCS0	Left Tilt	100	7.82	8.00	1.042	86.39	1.158	0.004	0.004
	WLAN5GHz	802.11a	Right Cheek	149	7.57	8.00	1.104	97.18	1.029	0.007	0.008
	WLAN5GHz	802.11a	Right Tilt	149	7.57	8.00	1.104	97.18	1.029	0.008	0.009
	WLAN5GHz	802.11a	Left Cheek	149	7.57	8.00	1.104	97.18	1.029	0.009	0.010

13#	WLAN5GHz	802.11a	Left Tilt	149	7.57	8.00	1.104	97.18	1.029	0.011	**0.013**

16.3. Body-worn SAR Data

<GSM>

Plot No.	Band	Mode	Test Position	Ch.	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
14#	GSM850	GPRS(3 TX slots)	Front Side	251	27.58	28.00	1.102	0.184	**0.203**
	GSM850	GPRS(3 TX slots)	Back Side	251	27.58	28.00	1.102	0.176	0.194
15#	GSM1900	GPRS(3 TX slots)	Front Side	810	25.95	26.50	1.135	0.580	**0.658**
	GSM1900	GPRS(3 TX slots)	Back Side	810	25.95	26.50	1.135	0.339	0.385

<WCDMA>

Plot No.	Band	Mode	Test Position	Ch.	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
16#	WCDMA Band II	RMC 12.2Kbps	Front Side	9262	20.82	21.00	1.042	0.677	**0.706**
	WCDMA Band II	RMC 12.2Kbps	Back Side	9262	20.82	21.00	1.042	0.207	0.216
17#	WCDMA Band V	RMC 12.2Kbps	Front Side	4233	23.48	24.00	1.127	0.276	**0.311**
	WCDMA Band V	RMC 12.2Kbps	Back Side	4233	23.48	24.00	1.127	0.234	0.264

<LTE >

Plot No.	Band	BW	Modulation RB/offset	Test Position	Ch.	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
18#	LTE Band 2	20Mhz	QPSK 1RB 0offset	Front Side	18700	20.68	21.00	1.076	0.562	**0.605**
	LTE Band 2	20Mhz	QPSK 1RB 0offset	Back Side	18700	20.68	21.00	1.076	0.187	0.201
	LTE Band 2	20Mhz	QPSK 50RB 0offset	Front Side	18700	19.74	20.00	1.062	0.462	0.491
	LTE Band 2	20Mhz	QPSK 50RB 0offset	Back Side	18700	19.74	20.00	1.062	0.153	0.162
19#	LTE Band 4	20Mhz	QPSK 1RB 0offset	Front Side	20300	22.32	22.50	1.042	0.662	**0.690**
	LTE Band 4	20Mhz	QPSK 1RB 0offset	Back Side	20300	22.32	22.50	1.042	0.304	0.317
	LTE Band 4	20Mhz	QPSK 50RB 50offset	Front Side	20300	22.26	22.50	1.057	0.516	0.545
	LTE Band 4	20Mhz	QPSK 50RB 50offset	Back Side	20300	22.26	22.50	1.057	0.243	0.257
20#	LTE Band 5	10Mhz	QPSK 1RB 0offset	Front Side	20600	21.65	22.00	1.084	0.186	**0.202**
	LTE Band 5	10Mhz	QPSK 1RB 0offset	Back Side	20600	21.65	22.00	1.084	0.156	0.169
	LTE Band 5	10Mhz	QPSK 25RB 0offset	Front Side	20600	20.58	21.00	1.102	0.136	0.150
	LTE Band 5	10Mhz	QPSK 25RB 0offset	Back Side	20600	20.58	21.00	1.102	0.138	0.152
	LTE Band 7	20Mhz	QPSK 1RB 0offset	Front Side	20850	22.13	22.50	1.089	0.321	0.350
21#	LTE Band 7	20Mhz	QPSK 1RB 0offset	Back Side	20850	22.13	22.50	1.089	0.376	**0.409**
	LTE Band 7	20Mhz	QPSK 50RB 0offset	Front Side	20850	20.82	21.50	1.169	0.280	0.327
	LTE Band 7	20Mhz	QPSK 50RB 0offset	Back Side	20850	20.82	21.50	1.169	0.297	0.347

<WLAN >

Plot No.	Band	Mode	Test Position	Ch.	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	WLAN2.4GHz	802.11b	Front Side	6	11.14	11.50	1.086	97.5	1.026	0.017	0.018
22#	WLAN2.4GHz	802.11b	Back Side	6	11.14	11.50	1.086	97.5	1.026	0.038	**0.043**
	WLAN5GHz	802.11a	Front Side	36	7.78	8.00	1.052	97.18	1.029	0.004	0.004
23#	WLAN5GHz	802.11a	Back Side	36	7.78	8.00	1.052	97.18	1.029	0.018	**0.019**
	WLAN5GHz	802.11a	Front Side	52	7.61	8.00	1.094	97.18	1.029	0.017	0.019
24#	WLAN5GHz	802.11a	Back Side	52	7.61	8.00	1.094	97.18	1.029	0.021	**0.023**
	WLAN5GHz	802.11n-HT20 MCS0	Front Side	100	7.82	8.00	1.042	86.39	1.158	0.006	0.007
25#	WLAN5GHz	802.11n-HT20 MCS0	Back Side	100	7.82	8.00	1.042	86.39	1.158	0.016	**0.019**
	WLAN5GHz	802.11a	Front Side	149	7.57	8.00	1.104	97.18	1.029	0.008	0.009
26#	WLAN5GHz	802.11a	Back Side	149	7.57	8.00	1.104	97.18	1.029	0.015	**0.017**

16.4. Hotspot SAR Data

<GSM>

Plot No.	Band	Mode	Test Position	Ch.	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
27#	GSM850	GPRS(3 TX slots)	Front Side	251	27.58	28.00	1.102	0.184	**0.203**
	GSM850	GPRS(3 TX slots)	Back Side	251	27.58	28.00	1.102	0.176	0.194
	GSM850	GPRS(3 TX slots)	Left Side	251	27.58	28.00	1.102	0.059	0.065
	GSM850	GPRS(3 TX slots)	Right Side	251	27.58	28.00	1.102	0.051	0.056
	GSM850	GPRS(3 TX slots)	Bottom Side	251	27.58	28.00	1.102	0.048	0.053
	GSM1900	GPRS(3 TX slots)	Front Side	810	25.95	26.50	1.135	0.580	0.658
	GSM1900	GPRS(3 TX slots)	Back Side	810	25.95	26.50	1.135	0.339	0.385
	GSM1900	GPRS(3 TX slots)	Left Side	810	25.95	26.50	1.135	0.256	0.291
	GSM1900	GPRS(3 TX slots)	Right Side	810	25.95	26.50	1.135	0.017	0.020
	GSM1900	GPRS(3 TX slots)	Bottom Side	810	25.95	26.50	1.135	0.824	0.935
	GSM1900	GPRS(3 TX slots)	Bottom Side	512	25.94	26.50	1.138	0.842	0.958
28#	GSM1900	GPRS(3 TX slots)	Bottom Side	661	25.92	26.50	1.143	0.937	**1.071**

<WCDMA>

Plot No.	Band	Mode	Test Position	Ch.	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	WCDMA Band II	RMC 12.2Kbps	Front Side	9262	20.82	21.00	1.042	0.677	0.706
	WCDMA Band II	RMC 12.2Kbps	Back Side	9262	20.82	21.00	1.042	0.207	0.216
	WCDMA Band II	RMC 12.2Kbps	Left Side	9262	20.82	21.00	1.042	0.233	0.243
	WCDMA Band II	RMC 12.2Kbps	Right Side	9262	20.82	21.00	1.042	0.064	0.067
29#	WCDMA Band II	RMC 12.2Kbps	Bottom Side	9400	20.82	21.00	1.042	0.955	**0.995**
	WCDMA Band II	RMC 12.2Kbps	Bottom Side	9538	20.72	21.00	1.067	0.889	0.948
	WCDMA Band II	RMC 12.2Kbps	Bottom Side	9262	20.76	21.00	1.057	0.910	0.962
30#	WCDMA Band V	RMC 12.2Kbps	Front Side	4233	23.48	24.00	1.127	0.276	**0.311**
	WCDMA Band V	RMC 12.2Kbps	Back Side	4233	23.48	24.00	1.127	0.234	0.264
	WCDMA Band V	RMC 12.2Kbps	Left Side	4233	23.48	24.00	1.127	0.100	0.113
	WCDMA Band V	RMC 12.2Kbps	Right Side	4233	23.48	24.00	1.127	0.063	0.070
	WCDMA Band V	RMC 12.2Kbps	Bottom Side	4233	23.48	24.00	1.127	0.082	0.092

<LTE >

Plot No.	Band	BW	Modulation RB/offset	Test Position	Ch.	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	LTE Band 2	20Mhz	QPSK 1RB 0offset	Front Side	18700	20.68	21.00	1.076	0.562	0.605
	LTE Band 2	20Mhz	QPSK 1RB 0offset	Back Side	18700	20.68	21.00	1.076	0.187	0.201
	LTE Band 2	20Mhz	QPSK 1RB 0offset	Left Side	18700	20.68	21.00	1.076	0.248	0.267
	LTE Band 2	20Mhz	QPSK 1RB 0offset	Right Side	18700	20.68	21.00	1.076	0.013	0.014
	LTE Band 2	20Mhz	QPSK 1RB 0offset	Bottom Side	18700	20.68	21.00	1.076	0.771	0.830
31#	LTE Band 2	20Mhz	QPSK 1RB 0offset	Bottom Side	18900	20.53	21.00	1.114	0.837	**0.933**
	LTE Band 2	20Mhz	QPSK 1RB 0offset	Bottom Side	19100	20.59	21.00	1.099	0.729	0.801
	LTE Band 2	20Mhz	QPSK 100RB 0offset	Bottom Side	18700	19.63	20.00	1.089	0.584	0.636
	LTE Band 2	20Mhz	QPSK 50RB 0offset	Front Side	18700	19.74	20.00	1.062	0.462	0.491
	LTE Band 2	20Mhz	QPSK 50RB 0offset	Back Side	18700	19.74	20.00	1.062	0.153	0.162
	LTE Band 2	20Mhz	QPSK 50RB 0offset	Left Side	18700	19.74	20.00	1.062	0.196	0.208
	LTE Band 2	20Mhz	QPSK 50RB 0offset	Right Side	18700	19.74	20.00	1.062	0.011	0.012
	LTE Band 2	20Mhz	QPSK 50RB 0offset	Bottom Side	18700	19.74	20.00	1.062	0.635	0.674
	LTE Band 4	20Mhz	QPSK 1RB 0offset	Front Side	20300	22.32	22.50	1.042	0.662	0.690
	LTE Band 4	20Mhz	QPSK 1RB 0offset	Back Side	20300	22.32	22.50	1.042	0.304	0.317
	LTE Band 4	20Mhz	QPSK 1RB 0offset	Left Side	20300	22.32	22.50	1.042	0.257	0.268
	LTE Band 4	20Mhz	QPSK 1RB 0offset	Right Side	20300	22.32	22.50	1.042	0.024	0.025
32#	LTE Band 4	20Mhz	QPSK 1RB 0offset	Bottom Side	20300	22.32	22.50	1.042	0.936	**0.976**
	LTE Band 4	20Mhz	QPSK 1RB 0offset	Bottom Side	20050	21.86	22.50	1.159	0.652	0.756
	LTE Band 4	20Mhz	QPSK 1RB 0offset	Bottom Side	20175	22.02	22.50	1.117	0.773	0.863
	LTE Band 4	20Mhz	QPSK 50RB 50offset	Front Side	20300	22.26	22.50	1.057	0.516	0.545
	LTE Band 4	20Mhz	QPSK 50RB 50offset	Back Side	20300	22.26	22.50	1.057	0.243	0.257
	LTE Band 4	20Mhz	QPSK 50RB 50offset	Left Side	20300	22.26	22.50	1.057	0.210	0.222
	LTE Band 4	20Mhz	QPSK 50RB 50offset	Right Side	20300	22.26	22.50	1.057	0.020	0.021
	LTE Band 4	20Mhz	QPSK 50RB 50offset	Bottom Side	20300	22.26	22.50	1.057	0.763	0.806
	LTE Band 4	20Mhz	QPSK 50RB 50offset	Bottom Side	20050	21.92	22.50	1.143	0.539	0.616
	LTE Band 4	20Mhz	QPSK 50RB 50offset	Bottom Side	20175	21.98	22.50	1.127	0.662	0.746
	LTE Band 4	20Mhz	QPSK 100RB 0offset	Bottom Side	20300	20.94	21.00	1.014	0.706	0.716
33#	LTE Band 5	10Mhz	QPSK 1RB 0offset	Front Side	20600	21.65	22.00	1.084	0.186	**0.202**
	LTE Band 5	10Mhz	QPSK 1RB 0offset	Back Side	20600	21.65	22.00	1.084	0.156	0.169

	LTE Band 5	10Mhz	QPSK 1RB 0offset	Left Side	20600	21.65	22.00	1.084	0.055	0.060
	LTE Band 5	10Mhz	QPSK 1RB 0offset	Right Side	20600	21.65	22.00	1.084	0.101	0.109
	LTE Band 5	10Mhz	QPSK 1RB 0offset	Bottom Side	20600	21.65	22.00	1.084	0.042	0.046
	LTE Band 5	10Mhz	QPSK 25RB 0offset	Front Side	20600	20.58	21.00	1.102	0.136	0.150
	LTE Band 5	10Mhz	QPSK 25RB 0offset	Back Side	20600	20.58	21.00	1.102	0.138	0.152
	LTE Band 5	10Mhz	QPSK 25RB 0offset	Left Side	20600	20.58	21.00	1.102	0.043	0.047
	LTE Band 5	10Mhz	QPSK 25RB 0offset	Right Side	20600	20.58	21.00	1.102	0.078	0.086
	LTE Band 5	10Mhz	QPSK 25RB 0offset	Bottom Side	20600	20.58	21.00	1.102	0.054	0.059
	LTE Band 7	20Mhz	QPSK 1RB 0offset	Front Side	20850	22.13	22.50	1.089	0.321	0.350
34#	LTE Band 7	20Mhz	QPSK 1RB 0offset	Back Side	20850	22.13	22.50	1.089	0.376	**0.409**
	LTE Band 7	20Mhz	QPSK 1RB 0offset	Left Side	20850	22.13	22.50	1.089	0.363	0.395
	LTE Band 7	20Mhz	QPSK 1RB 0offset	Right Side	20850	22.13	22.50	1.089	0.041	0.045
	LTE Band 7	20Mhz	QPSK 1RB 0offset	Bottom Side	20850	22.13	22.50	1.089	0.319	0.347
	LTE Band 7	20Mhz	QPSK 50RB 0offset	Front Side	20850	20.82	21.50	1.169	0.280	0.327
	LTE Band 7	20Mhz	QPSK 50RB 0offset	Back Side	20850	20.82	21.50	1.169	0.297	0.347
	LTE Band 7	20Mhz	QPSK 50RB 0offset	Left Side	20850	20.82	21.50	1.169	0.273	0.319
	LTE Band 7	20Mhz	QPSK 50RB 0offset	Right Side	20850	20.82	21.50	1.169	0.026	0.030
	LTE Band 7	20Mhz	QPSK 50RB 0offset	Bottom Side	20850	20.82	21.50	1.169	0.256	0.299

<WLAN >

Plot No.	Band	Mode	Test Position	Ch.	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	WLAN2.4GHz	802.11b	Front Side	6	11.14	11.50	1.086	97.5	1.026	0.017	0.018
35#	WLAN2.4GHz	802.11b	Back Side	6	11.14	11.50	1.086	97.5	1.026	0.038	**0.043**
	WLAN2.4GHz	802.11b	Right Side	6	11.14	11.50	1.086	97.5	1.026	0.010	0.011
	WLAN2.4GHz	802.11b	Top Side	6	11.14	11.50	1.086	97.5	1.026	0.033	0.036
	WLAN5GHz	802.11a	Front Side	36	7.78	8.00	1.052	97.18	1.029	0.004	0.004
	WLAN5GHz	802.11a	Back Side	36	7.78	8.00	1.052	97.18	1.029	0.018	0.019
	WLAN5GHz	802.11a	Right Side	36	7.78	8.00	1.052	97.18	1.029	0.002	0.002
36#	WLAN5GHz	802.11a	Top Side	36	7.78	8.00	1.052	97.18	1.029	0.022	**0.024**
	WLAN5GHz	802.11a	Front Side	52	7.61	8.00	1.094	97.18	1.029	0.017	0.019
	WLAN5GHz	802.11a	Back Side	52	7.61	8.00	1.094	97.18	1.029	0.021	0.023
	WLAN5GHz	802.11a	Right Side	52	7.61	8.00	1.094	97.18	1.029	0.004	0.005
37#	WLAN5GHz	802.11a	Top Side	52	7.61	8.00	1.094	97.18	1.029	0.027	**0.031**
	WLAN5GHz	802.11n-HT20 MCS0	Front Side	100	7.82	8.00	1.042	86.39	1.158	0.006	0.007
	WLAN5GHz	802.11n-HT20 MCS0	Back Side	100	7.82	8.00	1.042	86.39	1.158	0.016	0.019
	WLAN5GHz	802.11n-HT20 MCS0	Right Side	100	7.82	8.00	1.042	86.39	1.158	0.004	0.005
38#	WLAN5GHz	802.11n-HT20 MCS0	Top Side	100	7.82	8.00	1.042	86.39	1.158	0.017	**0.021**
	WLAN5GHz	802.11a	Front Side	149	7.57	8.00	1.104	97.18	1.029	0.008	0.009
	WLAN5GHz	802.11a	Back Side	149	7.57	8.00	1.104	97.18	1.029	0.015	0.017
	WLAN5GHz	802.11a	Right Side	149	7.57	8.00	1.104	97.18	1.029	0.020	0.023
39#	WLAN5GHz	802.11a	Top Side	149	7.57	8.00	1.104	97.18	1.029	0.023	**0.026**

16.5. Repeated SAR Measurement

In accordance with published RF Exposure KDB procedure 865664 D01 SAR measurement 100 MHz to 6 GHz. These additional measurements are repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device should be returned to ambient conditions (normal room temperature) with the battery fully charged before it is re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

1) Repeated measurement is not required when the original highest measured SAR is < 0.80 W/kg; steps 2)through 4) do not apply.
2) When the original highest measured SAR is ≥ 0.80 W/kg, repeat that measurement once.
3) Perform a second repeated measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is > 1.20 or when the original or repeated measurement is ≥ 1.45 W/kg (~ 10% from the 1-g SAR limit).
4) Perform a third repeated measurement only if the original, first or second repeated measurement is ≥1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.

<Hotspot Repeated SAR (Test distance 10mm)>

Plot No.	Band	BW (MHz)	Mode	Test Position	Ch.	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
OR	GSM1900	-	GPRS(3 TX slots)	Bottom Side	661	25.92	26.50	1.143	0.937	**1.071**
Repeated	GSM1900	-	GPRS(3 TX slots)	Bottom Side	661	25.92	26.50	1.143	0.932	1.065
OR	WCDMA Band II	-	RMC 12.2Kbps	Bottom Side	9400	20.82	21.00	1.042	0.955	**0.995**
Repeated	WCDMA Band II	-	RMC 12.2Kbps	Bottom Side	9400	20.82	21.00	1.042	0.954	0.994
OR	LTE Band 2	20Mhz	QPSK 1RB 0offset	Bottom Side	18900	20.53	21.00	1.114	0.837	**0.933**
Repeated	LTE Band 2	20Mhz	QPSK 1RB 0offset	Bottom Side	18900	20.53	21.00	1.114	0.835	0.930
OR	LTE Band 4	20Mhz	QPSK 1RB 0offset	Bottom Side	20300	22.32	22.50	1.042	0.936	**0.976**
Repeated	LTE Band 4	20Mhz	QPSK 1RB 0offset	Bottom Side	20300	22.32	22.50	1.042	0.934	0.974

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17. Stand-alone SAR test Exclusion

Bluetooth SAR is estimated per KDB 447498 D01v06 based on the formula below.

The 1-g and 10-g SAR test exclusion thresholds 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 and ≤ 7.5 for 10-g extremity 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

When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine

<Bluetooth Estimated SAR>

Maximum tune-up tolerance (dBm)	Maximum tune-up tolerance (mW)	Minimum Distance(mm)	Frequency(GHz)	Test threshold
9.50	8.91	10	2.44	1.39

Maximum tune-up tolerance (dBm)	Maximum tune-up tolerance (mW)	Minimum Distance(mm)	Frequency(GHz)	Estimated SAR (W/kg)
9.50	8.91	10	2.44	0.186

Note: Held-to ear configuration are not applicable to Bluetooth operations and therefore were not considered for simultaneous transmission.

18. Simultaneous Transmission Evaluation

Simultaneous Evaluation:

No.	Simultaneous transmission Condition	Head	Body-worn	Hotspot
1	GSM/GPRS/EDGE + WLAN 2.4GHz	Yes	Yes	Yes
2	WCDMA + WLAN 2.4GHz	Yes	Yes	Yes
3	LTE + WLAN 2.4GHz	Yes	Yes	Yes
4	GSM/GPRS/EDGE + WLAN 5GHz	Yes	Yes	Yes
5	WCDMA + WLAN 5GHz	Yes	Yes	Yes
6	LTE + WLAN 5GHz	Yes	Yes	Yes
7	GSM/GPRS/EDGE + Bluetooth	Yes	Yes	Yes
8	WCDMA + Bluetooth	Yes	Yes	Yes
9	LTE + Bluetooth	Yes	Yes	Yes

Note:

1. When the user enables the personal wireless router functions for the handset, actual operations include simultaneous transmission of both the Wi-Fi transmitter and another WWAN transmitter. Both transmitter often do not transmit at the same transmitting frequency and thus cannot be evaluated for SAR under actual use conditions. The "Portable Hotspot" feature on the handset was NOT activated, to ensure the SAR measurements were evaluated for a single transmission frequency RF signal.
2. The hotspot SAR result may overlap with the body-worn accessory SAR requirements, per KDB 941225 D06, the more conservative configurations can be considered, thus excluding some unnecessary body-worn accessory SAR tests.
3. GSM supports voice and data transmission, though not simultaneously. WCDMA supports voice and data transmission simultaneously.
4. Simultaneous Transmission SAR evaluation is not required for BT and Wi-Fi , because the software mechanism have been incorporated to guarantee that the WLAN and Bluetooth transmitters would not simultaneously operate.
5. Per KDB 447498D01v06, Simultaneous Transmission SAR Evaluation procedures is as followed:

   Step 1: If sum of 1 g SAR < 1.6 W/kg, Simultaneous SAR measurement is not required.

   Step 2: If sum of 1 g SAR > 1.6 W/kg, ratio of SAR to peak separation distance for pair of transmitters calculated.

   Step 3: If the ratio of SAR to peak separation distance is ≤ 0.04, Simultaneous SAR measurement is not required.

   Step 4: If the ratio of SAR to peak separation distance is > 0.04, Simultaneous SAR measurement is required and simultaneous transmission SAR value is calculated.

   (The ratio is determined by: (SAR1 + SAR2) ^ 1.5/Ri ≤ 0.04,

   Ri is the separation distance between the peak SAR locations for the antenna pair in mm.

< Head Exposure>

WWAN Band		Exposure Position	WWAN 1g SAR (W/kg)	2.4GHz WLAN 1g SAR (W/kg)	5GHz WLAN 1g SAR (W/kg)	WWAN+2.4G WLAN Summed 1g SAR (W/kg)	WWAN+5G WLAN Summed 1g SAR (W/kg)
GSM	GSM850	Right Cheek	0.140	0.071	0.027	0.211	0.167
		Right Tilt	0.069	0.089	0.072	0.158	0.141
		Left Cheek	0.166	0.047	0.032	0.213	0.198
		Left Tilt	0.101	0.052	0.031	0.153	0.132
	GSM1900	Right Cheek	0.124	0.071	0.027	0.195	0.151
		Right Tilt	0.006	0.089	0.072	0.095	0.078
		Left Cheek	0.453	0.047	0.032	0.500	0.485
		Left Tilt	0.096	0.052	0.031	0.148	0.127
WCDMA	WCDMA Band II	Right Cheek	0.204	0.071	0.027	0.275	0.231
		Right Tilt	0.122	0.089	0.072	0.211	0.194
		Left Cheek	0.425	0.047	0.032	0.472	0.457
		Left Tilt	0.132	0.052	0.031	0.184	0.163
	WCDMA Band V	Right Cheek	0.195	0.071	0.027	0.266	0.222
		Right Tilt	0.115	0.089	0.072	0.204	0.187
		Left Cheek	0.207	0.047	0.032	0.254	0.239
		Left Tilt	0.115	0.052	0.031	0.167	0.146
LTE	LTE Band 2	Right Cheek	0.141	0.071	0.027	0.212	0.168
		Right Tilt	0.101	0.089	0.072	0.190	0.173
		Left Cheek	0.313	0.047	0.032	0.360	0.345
		Left Tilt	0.076	0.052	0.031	0.128	0.107
	LTE Band 4	Right Cheek	0.200	0.071	0.027	0.271	0.227
		Right Tilt	0.155	0.089	0.072	0.244	0.227
		Left Cheek	0.481	0.047	0.032	0.528	0.513
		Left Tilt	0.114	0.052	0.031	0.166	0.145
	LTE Band 5	Right Cheek	0.014	0.071	0.027	0.085	0.041
		Right Tilt	0.002	0.089	0.072	0.091	0.074
		Left Cheek	0.075	0.047	0.032	0.122	0.107
		Left Tilt	0.017	0.052	0.031	0.069	0.048
	LTE Band 7	Right Cheek	0.104	0.071	0.027	0.175	0.131
		Right Tilt	0.121	0.089	0.072	0.210	0.193
		Left Cheek	0.304	0.047	0.032	0.351	0.336
		Left Tilt	0.063	0.052	0.031	0.115	0.094

<Hotspot Exposure>

WWAN Band	Exposure Position	WWAN 1g SAR (W/kg)	2.4GHz WLAN 1g SAR (W/kg)	5GHz WLAN 1g SAR (W/kg)	Bluetooth Estimated 1g SAR (W/kg)	WWAN + 2.4GHz WLAN Summed 1g SAR (W/kg)	WWAN + 5GHz WLAN Summed 1g SAR (W/kg)	WWAN + Bluetooth Summed 1g SAR (W/kg)
GSM850	Front	0.203	0.018	0.019	0.186	0.221	0.222	0.389
	Back	0.194	0.043	0.023	0.186	0.237	0.217	0.380
	Left side	0.065				0.065	0.065	0.065
	Right side	0.056	0.011	0.023	0.186	0.067	0.079	0.242
	Top side		0.036	0.031	0.186	0.036	0.031	0.186
	Bottom side	0.053				0.053	0.053	0.053
GSM1900	Front	0.658	0.018	0.019	0.186	0.676	0.677	0.844
	Back	0.385	0.043	0.023	0.186	0.428	0.408	0.571
	Left side	0.291				0.291	0.291	0.291
	Right side	0.020	0.011	0.023	0.186	0.031	0.043	0.206
	Top side		0.036	0.031	0.186	0.036	0.031	0.186
	Bottom side	1.071				1.071	1.071	1.071
WCDMA Band II	Front	0.706	0.018	0.019	0.186	0.724	0.725	0.892
	Back	0.216	0.043	0.023	0.186	0.259	0.239	0.402
	Left side	0.243				0.243	0.243	0.243
	Right side	0.067	0.011	0.023	0.186	0.078	0.090	0.253
	Top side		0.036	0.031	0.186	0.036	0.031	0.186
	Bottom side	0.995				0.995	0.995	0.995
WCDMA Band V	Front	0.311	0.018	0.019	0.186	0.329	0.330	0.497
	Back	0.264	0.043	0.023	0.186	0.307	0.287	0.450
	Left side	0.113				0.113	0.113	0.113
	Right side	0.070	0.011	0.023	0.186	0.081	0.093	0.256
	Top side		0.036	0.031	0.186	0.036	0.031	0.186
	Bottom side	0.092				0.092	0.092	0.092
LTE Band 2	Front	0.605	0.018	0.019	0.186	0.623	0.624	0.791
	Back	0.201	0.043	0.023	0.186	0.244	0.224	0.387
	Left side	0.267				0.267	0.267	0.267
	Right side	0.014	0.011	0.023	0.186	0.025	0.037	0.200
	Top side		0.036	0.031	0.186	0.036	0.031	0.186
	Bottom side	0.933				0.933	0.933	0.933
LTE Band 4	Front	0.690	0.018	0.019	0.186	0.708	0.709	0.876

	Back	0.317	0.043	0.023	0.186	0.360	0.340	0.503
	Left side	0.268				0.268	0.268	0.268
	Right side	0.025	0.011	0.023	0.186	0.036	0.048	0.211
	Top side		0.036	0.031	0.186	0.036	0.031	0.186
	Bottom side	0.976				0.976	0.976	0.976
LTE Band 5	Front	0.202	0.018	0.019	0.186	0.220	0.221	0.388
	Back	0.169	0.043	0.023	0.186	0.212	0.192	0.355
	Left side	0.060				0.060	0.060	0.060
	Right side	0.109	0.011	0.023	0.186	0.120	0.132	0.295
	Top side		0.036	0.031	0.186	0.036	0.031	0.186
	Bottom side	0.059				0.059	0.059	0.059
LTE Band 7	Front	0.350	0.018	0.019	0.186	0.368	0.369	0.536
	Back	0.409	0.043	0.023	0.186	0.452	0.432	0.595
	Left side	0.395				0.395	0.395	0.395
	Right side	0.045	0.011	0.023	0.186	0.056	0.068	0.231
	Top side		0.036	0.031	0.186	0.036	0.031	0.186
	Bottom side	0.347				0.347	0.347	0.347

<Body-worn Exposure>

WWAN Band	Exposure Position	1 WWAN 1g SAR (W/kg)	2 2.4GHz WLAN 1g SAR (W/kg)	4 5GHz WLAN 1g SAR (W/kg)	6 Bluetooth Estimated 1g SAR (W/kg)	WWAN + 2.4GHz WLAN Summed 1g SAR (W/kg)	WWAN + 5GHz WLAN Summed 1g SAR (W/kg)	WWAN + Bluetooth Summed 1g SAR (W/kg)
GSM850	Front	0.203	0.018	0.019	0.186	0.221	0.222	0.389
	Back	0.194	0.043	0.023	0.186	0.237	0.217	0.380
GSM1900	Front	0.658	0.018	0.019	0.186	0.676	0.677	0.844
	Back	0.385	0.043	0.023	0.186	0.428	0.408	0.571
WCDMA Band II	Front	0.706	0.018	0.019	0.186	0.724	0.725	0.892
	Back	0.216	0.043	0.023	0.186	0.259	0.239	0.402
WCDMA Band V	Front	0.311	0.018	0.019	0.186	0.329	0.330	0.497
	Back	0.264	0.043	0.023	0.186	0.307	0.287	0.450
LTE Band 2	Front	0.605	0.018	0.019	0.186	0.623	0.624	0.791
	Back	0.201	0.043	0.023	0.186	0.244	0.224	0.387
LTE Band 4	Front	0.690	0.018	0.019	0.186	0.708	0.709	0.876
	Back	0.317	0.043	0.023	0.186	0.360	0.340	0.503
LTE Band 5	Front	0.202	0.018	0.019	0.186	0.220	0.221	0.388
	Back	0.169	0.043	0.023	0.186	0.212	0.192	0.355
LTE Band 7	Front	0.350	0.018	0.019	0.186	0.368	0.369	0.536
	Back	0.409	0.043	0.023	0.186	0.452	0.432	0.595

19. Uncertainty Assessment

The component of uncertainly may generally be categorized according to the methods used to evaluate them. The evaluation of uncertainly by the statistical analysis of a series of observations is termed a Type An evaluation of uncertainty. The evaluation of uncertainty by means other than the statistical analysis of a series of observation is termed a Type B evaluation of uncertainty. Each component of uncertainty, however evaluated, is represented by an estimated standard deviation, termed standard uncertainty, which is determined by the positive square root of the estimated variance.

A Type A evaluation of standard uncertainty may be based on any valid statistical method for treating data. This includes calculating the standard deviation of the mean of a series of independent observations; using the method of least squares to fit a curve to the data in order to estimate the parameter of the curve and their standard deviations; or carrying out an analysis of variance in order to identify and quantify random effects in certain kinds of measurement.

A type B evaluation of standard uncertainty is typically based on scientific judgment using all of the relevant information available. These may include previous measurement data, experience, and knowledge of the behavior and properties of relevant materials and instruments, manufacture's specification, data provided in calibration reports and uncertainties assigned to reference data taken from handbooks. Broadly speaking, the uncertainty is either obtained from an outdoor source or obtained from an assumed distribution, such as the normal distribution, rectangular or triangular distributions indicated in table below.

Uncertainty	Normal	Rectangular	Triangular	U-Shape
Multi-plying Factor[(a)]	1/k[(b)]	$1/\sqrt{3}$	$1/\sqrt{6}$	$1/\sqrt{2}$

Table 8.1. Standard Uncertainty for Assumed Distribution

(a) standard uncertainty is determined as the product of the multiplying factor and the estimated range of variations in the measured quantity

(b) κ is the coverage factor

The combined standard uncertainty of the measurement result represents the estimated standard deviation of the result. It is obtained by combining the individual standard uncertainties of both Type A and Type B evaluation using the usual "root-sum-squares" (RSS) methods of combining standard deviations by taking the positive square root of the estimated variances.

Expanded uncertainty is a measure of uncertainty that defines an interval about the measurement result within which the measured value is confidently believed to lie. It is obtained by multiplying the combined standard uncertainty by a coverage factor. Typically, the coverage factor ranges from 2 to 3. Using a coverage factor allows the true value of a measured quantity to be specified with a defined probability within the specified uncertainty range. For purpose of this document, a coverage factor two is used, which corresponds to confidence interval of about 95 %. The DASY uncertainty Budget is shown in the following tables.

Error Description	Uncertainty Value (±%)	Probability	Divisor	(Ci) 1g	(Ci) 10g	Standard Uncertainty (1g) (±%)	Standard Uncertainty (10g) (±%)
Measurement System							
Probe Calibration	6.0	N	1	1	1	6.0	6.0
Axial Isotropy	4.7	R	1.732	0.7	0.7	1.9	1.9
Hemispherical Isotropy	9.6	R	1.732	0.7	0.7	3.9	3.9
Boundary Effects	1.0	R	1.732	1	1	0.6	0.6
Linearity	4.7	R	1.732	1	1	2.7	2.7
System Detection Limits	1.0	R	1.732	1	1	0.6	0.6
Modulation Response	3.2	R	1.732	1	1	1.8	1.8
Readout Electronics	0.3	N	1	1	1	0.3	0.3
Response Time	0.0	R	1.732	1	1	0.0	0.0
Integration Time	2.6	R	1.732	1	1	1.5	1.5
RF Ambient Noise	3.0	R	1.732	1	1	1.7	1.7
RF Ambient Reflections	3.0	R	1.732	1	1	1.7	1.7
Probe Positioner	0.4	R	1.732	1	1	0.2	0.2
Probe Positioning	2.9	R	1.732	1	1	1.7	1.7
Max. SAR Eval.	2.0	R	1.732	1	1	1.2	1.2
Test Sample Related							
Device Positioning	3.0	N	1	1	1	3.0	3.0
Device Holder	3.6	N	1	1	1	0.089	0.089
Power Drift	5.0	R	1.732	1	1	2.9	2.9
Power Scaling	0.0	R	1.732	1	1	0.0	0.0
Phantom and Setup							
Phantom Uncertainty	6.1	R	1.732	1	1	3.5	3.5
SAR correction	0.0	R	1.732	1	0.84	0.0	0.0
Liquid Conductivity Repeatability	0.2	N	1	0.78	0.71	0.1	0.1
Liquid Conductivity (target)	5.0	R	1.732	0.78	0.71	2.3	2.0
Liquid Conductivity (mea.)	2.5	R	1.732	0.78	0.71	1.1	1.0
Temp. unc. - Conductivity	3.4	R	1.732	0.78	0.71	1.5	1.4
Liquid Permittivity Repeatability	0.15	N	1	0.23	0.26	0.0	0.0
Liquid Permittivity (target)	5.0	R	1.732	0.23	0.26	0.7	0.8
Liquid Permittivity (mea.)	2.5	R	1.732	0.23	0.26	0.3	0.4
Temp. unc. - Permittivity	0.83	R	1.732	0.23	0.26	0.1	0.1
Combined Std. Uncertainty						11.4%	11.4%
Coverage Factor for 95 %						K=2	K=2
Expanded STD Uncertainty						22.9%	22.7%

Error Description	Uncertainty Value (±%)	Probability	Divisor	(Ci) 1g	(Ci) 10g	Standard Uncertainty (1g) (±%)	Standard Uncertainty (10g) (±%)
Measurement System							
Probe Calibration	6.55	N	1	1	1	6.0	6.0
Axial Isotropy	4.7	R	1.732	0.7	0.7	1.9	1.9
Hemispherical Isotropy	9.6	R	1.732	0.7	0.7	3.9	3.9
Boundary Effects	2.0	R	1.732	1	1	1.2	1.2
Linearity	4.7	R	1.732	1	1	2.7	2.7
System Detection Limits	1.0	R	1.732	1	1	0.6	0.6
Modulation Response	3.2	R	1.732	1	1	1.8	1.8
Readout Electronics	0.3	N	1	1	1	0.3	0.3
Response Time	0.0	R	1.732	1	1	0.0	0.0
Integration Time	2.6	R	1.732	1	1	1.5	1.5
RF Ambient Noise	3.0	R	1.732	1	1	1.7	1.7
RF Ambient Reflections	3.0	R	1.732	1	1	1.7	1.7
Probe Positioner	0.4	R	1.732	1	1	0.2	0.2
Probe Positioning	6.7	R	1.732	1	1	3.9	3.9
Max. SAR Eval.	4.0	R	1.732	1	1	2.3	2.3
Test Sample Related							
Device Positioning	3.0	N	1	1	1	3.0	3.0
Device Holder	3.6	N	1	1	1	0.089	0.089
Power Drift	5.0	R	1.732	1	1	2.9	2.9
Power Scaling	0.0	R	1.732	1	1	0.0	0.0
Phantom and Setup							
Phantom Uncertainty	6.1	R	1.732	1	1	3.8	3.8
SAR correction	0.0	R	1.732	1	0.84	0.0	0.0
Liquid Conductivity Repeatability	0.2	N	1	0.78	0.71	0.1	0.1
Liquid Conductivity (target)	5.0	R	1.732	0.78	0.71	2.3	2.0
Liquid Conductivity (mea.)	2.5	R	1.732	0.78	0.71	1.1	1.0
Temp. unc. - Conductivity	3.4	R	1.732	0.78	0.71	1.5	1.4
Liquid Permittivity Repeatability	0.15	N	1	0.23	0.26	0.0	0.0
Liquid Permittivity (target)	5.0	R	1.732	0.23	0.26	0.7	0.8
Liquid Permittivity (mea.)	2.5	R	1.732	0.23	0.26	0.3	0.4
Temp. unc. - Permittivity	0.83	R	1.732	0.23	0.26	0.1	0.1
Combined Std. Uncertainty						12.5%	12.5%
Coverage Factor for 95 %						K=2	K=2
Expanded STD Uncertainty						25.1 %	25.1%