



SAR TEST REPORT

Report Reference No.....: JTT201706047

FCC ID.....: 2AMQMTAB700

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Date of issue.....: July 12, 2017

Testing Laboratory Name: Shenzhen Yidajietong Test Technology Co., Ltd.

Address: 3/F., Building 12, Shangsha Innovation & Technology Park, Futian District, Shenzhen, Guangdong, China

Applicant's name.....: GATEGUARD, INC.

Address: 106 WEST 32nd Street, 2nd Floor, New York, United States

Test specification

Standard: IEEE 1528:2013

Standard: 47CFR §2.1093

TRF Originator.....: Shenzhen Yidajietong Test Technology Co., Ltd.

Master TRF.....: Dated 2014-01

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Test item description: Tablet PC

Trade Mark: teman

Manufacturer: 4U Electronics Co.,Ltd

Model/Type reference.....: TAB 700

Listed Models: /

Ratings: DC 3.70V

EUT Type: Production Unit

Exposure category.....: General population / Uncontrolled environment

Result.....: PASS

TEST REPORT

Test Report No. : JTT201706047	July 12, 2017
	Date of issue

Equipment under Test : **Tablet PC**

Model /Type : TAB 700

Listed Models : /

Applicant : **GATEGUARD, INC.**

Address : 106 WEST 32nd Street,2nd Floor, New York, United States

Manufacturer : **4U Electronics Co.,Ltd**

Address : C1 Building, Huang Ma Bu 3rd Industry Park, Bao'an District, Shenzhen, China

Test Result:	PASS
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The test report merely corresponds to the test sample.

It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

**** Modified History ****

Revision	Description	Issued Data	Remark
Revision 1.0	Initial Test Report Release	2017-07-12	Eric Wang

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1. TEST STANDARDS

The tests were performed according to following standards:

[IEEE 1528-2013 \(2014-06\)](#): Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques

[IEEE Std. C95-3 \(2002\)](#): IEEE Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields – RF and Microwave

[IEEE Std. C95-1 \(1992\)](#): IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.

[KDB 865664D01v01r04 \(August 7, 2015\)](#): SAR Measurement Requirements for 100 MHz to 6 GHz

[KDB 865664D02v01r02 \(October 23, 2015\)](#): RF Exposure Compliance Reporting and Documentation Considerations

[KDB 447498 D01 General RF Exposure Guidance v06 \(October 23, 2015\)](#): Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies

[KDB 447498 D03 Supplement C Cross-Reference v01 \(January 17, 2014\)](#): Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies

[KDB 248227 D01 802.11 Wi-Fi SAR v02r02](#): SAR GUIDANCE FOR IEEE 802.11 (Wi-Fi) TRANSMITTERS

[KDB 941225 D01 3G SAR Procedures v03r01](#): 3G SAR Measurement Procedures

[KDB 941225 D05 SAR for LTE Devices v02r05](#): SAR Evaluation Considerations for LTE Devices

[KDB 616217 D04 SAR for laptop and tablets v01r02](#): SAR Evaluation Considerations for Laptop, Netbook, Netbook and Tablet Computers

2. SUMMARY

2.1. General Remarks

Date of receipt of test sample	:	June 26, 2017
Testing commenced on	:	June 26, 2017
Testing concluded on	:	July 04, 2017

2.2. Summary SAR Results

The maximum of results of SAR found during testing for Acer One 7 are follows:

<Highest Reported standalone SAR Summary>

Classment Class	Frequency Band	Head (Report SAR _{1-g} (W/Kg))	Body-worn (Report SAR _{1-g} (W/Kg))
PCE	GSM 850	0.348	0.954
	GSM1900	0.255	0.743
	WCDMA Band V	0.338	0.892
	WCDMA Band IV	0.269	0.814
	LTE Band 2	0.151	0.792
	LTE Band 4	0.252	0.763
	LTE Band 12	0.346	0.979
DTS	2.4GWLAN	0.699	0.523

This device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6 W/kg) specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-2005, and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2013;

<Highest Reported simultaneous SAR Summary>

Exposure Position	Frequency Band	Reported SAR _{1-g} (W/kg)	Classment Class	Highest Reported Simultaneous Transmission SAR _{1-g} (W/kg)
Body-worn	LTE Band 12	0.979	PCE	1.502
	2.4GWLAN	0.523	DTS	

2.3. Equipment under Test

Power supply system utilised

Power supply voltage	:	☐ 120V / 60 Hz	☐ 115V / 60Hz
		☐ 12 V DC	☐ 24 V DC
		☒ Other (specified in blank below)	

DC 3.70 V

2.4. EUT operation mode

The spatial peak SAR values were assessed for Tablet PC.

2.5. Internal Identification of AE used during the test

EUT ID*	SN or IMEI	HW Version	SW Version
EUT2	865698890366065	RC-LF705	TAB700.MO.V01
EUT3	865698890894127	RC-LF705	TAB700.MO.V01

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

Note: It is performed to test SAR with the EUT2, and conducted power with the EUT3;

2.6. Product Description

EUT Name	: Tablet PC
Model Number	: TAB 700
EUT function description	: Please reference user manual of this device
Power supply	: DC 3.70V by battery(3000mAh); Charging voltage: DC 5.0V, 2A
Operation frequency range	: 2412 MHz – 2462 MHz / 2402 MHz – 2480 MHz 824.2 MHz – 848.8 MHz / 1850.2 MHz – 1909.8 MHz 826.4 MHz – 846.6 MHz / 1712.4 MHz – 1752.6 MHz 1850 MHz – 1910 MHz / 1710 MHz – 1755 MHz / 699 MHz – 716 MHz
Hardware version	: RC-LF705
Software version	: TAB700.MO.V01
Antenna Type	: PIFA antenna; 0dBi (max.) for GSM 850 and PCS 1900; 0dBi (max.) for WCDMA Band IV and WCDMA Band V 0dBi (max.) for LTE Band 2 / 4 / 12 -1.0dBi (max.) for BT and WLAN
Device Type	: Portable
Sample Type	: Prototype Unit
Modulation Type	: GMSK for GSM/GPRS, 8-PSK for EDGE, QPSK for UMTS, QPSK, 16QAM for LTE
WLAN	: Supported IEEE 802.11b/IEEE 802.11g/IEEE 802.11n
WLAN FCC Operation Frequency	: IEEE 802.11b:2412-2462MHz IEEE 802.11g:2412-2462MHz IEEE 802.11n HT20:2412-2462MHz IEEE 802.11n HT40:2422-2452MHz
WLAN Channel Number	: 11 Channels for WLAN 20MHz Bandwidth(IEEE 802.11b/g/n HT20) 7 Channels for WLAN 40MHz Bandwidth(IEEE 802.11n HT40)
WLAN Modulation Technology	: IEEE 802.11b: DSSS(CCK,DQPSK,DBPSK) IEEE 802.11g: OFDM(64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n: OFDM (64QAM, 16QAM,QPSK,BPSK)
Bluetooth	: Supported BT 4.0
Bluetooth Operation frequency	: 2402MHz-2480MHz
Bluetooth Modulation Type	: GFSK, $\pi/4$ DQPSK, 8DPSK
Bluetooth Channel Number	: 79 Channels / 40 Channels
GPS function	: Supported and only RX
Extreme temp. Tolerance	: -30°C to +50°C
Extreme vol. Limits	: 3.40VDC to 4.20VDC (nominal: 3.70VDC)
GSM/EDGE/GPRS Operation Frequency Band	: GSM850/PCS1900/GPRS850/GPRS1900/EDGE850/EDGE1900
GSM/EDGE/GPRS	: Supported GSM/GPRS/EDGE
GSM Release Version	: R99
GSM/EDGE/GPRS Power Class	: GSM850:Power Class 4/ PCS1900:Power Class 1
GPRS/EDGE Multislot Class	: GPRS/EDGE: Multi-slot Class 12
GPRS operation mode	: Class B
WCDMA Release Version	: R99
HSDPA Release Version	: Release 8
HSUPA Release Version	: Release 6
DC-HSUPA Release Version	: Not Supported
LTE Release Version	: R8
LTE/UMTS Power Class	: Class 3
Exposure category:	: General population / Uncontrolled environment
VoIP	: Support

3. TEST ENVIRONMENT

3.1. Address of the test laboratory

Shenzhen Yidajietong Test Technology Co., Ltd.

3/F., Building 12, Shangsha Innovation & Technology Park, Futian District, Shenzhen, Guangdong, China

3.2. Test Facility

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

CNAS-Lab Code: L7547

The Testing and Technology Center for Shenzhen Yidajietong Test Technology Co., Ltd. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC 17025: 2005 General Requirements) for the Competence of Testing and Calibration Laboratories, Date of Registration: March, 2015. Valid time is until March, 2018.

3.3. Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature:	18-25 ° C
Humidity:	40-65 %
Atmospheric pressure:	950-1050mbar

3.4. SAR Limits

FCC Limit (1g Tissue)

Exposure Limits	SAR (W/kg)	
	(General Population / Uncontrolled Exposure Environment)	(Occupational / Controlled Exposure Environment)
Spatial Average (averaged over the whole body)	0.08	0.4
Spatial Peak (averaged over any 1 g of tissue)	1.60	8.0
Spatial Peak (hands/wrists/feet/ankles averaged over 10 g)	4.0	20.0

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

Occupational/Controlled 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).

3.5. Equipments Used during the Test

Test Equipment	Manufacturer	Type/Model	Serial Number	Calibration	
				Last Calibration	Calibration Interval
Data Acquisition Electronics DAEx	SPEAG	DAE4	1315	2016/07/26	1
E-field Probe	SPEAG	ES3DV3	3292	2016/09/02	1
System Validation Dipole D750V3	SPEAG	D750V3	1163	2016/09/19	3
System Validation Dipole D835V2	SPEAG	D835V2	4d141	2015/09/24	3
System Validation Dipole 1750V2	SPEAG	D1750V2	1075	2016/10/11	3
System Validation Dipole 1900V2	SPEAG	D1900V2	5d162	2015/09/16	3
System Validation Dipole D2450V2	SPEAG	D2450V2	818	2015/09/14	3
Network analyzer	Agilent	8753E	US37390562	2017/02/26	1
Dielectric Probe Kit	Agilent	85070E	US44020288	/	/
Power meter	Agilent	E4417A	GB41292254	2016/12/15	1
Power sensor	Agilent	8481H	MY41095360	2016/12/15	1
Power sensor	Agilent	8481H	MY41095361	2016/12/15	1
Signal generator	IFR	2032	203002/100	2016/10/12	1
Amplifier	AR	75A250	302205	2016/10/12	1

Note:

- 1) Per KDB865664D01 requirements for dipole calibration, the test laboratory has adopted three year extended calibration interval. Each measured dipole is expected to evaluate with following criteria at least on annual interval.
 - a) There is no physical damage on the dipole;
 - b) System check with specific dipole is within 10% of calibrated values;
 - c) The most recent return-loss results, measured at least annually, deviates by no more than 20% from the previous measurement;
 - d) The most recent measurement of the real or imaginary parts of the impedance, measured at least annually is within 50 Ω from the previous measurement.
- 2) Network analyzer probe calibration against air, distilled water and a shorting block performed before measuring liquid parameters.

4. SAR Measurements System configuration

4.1. SAR Measurement Set-up

The DASY5 system for performing compliance tests consists of the following items:

A standard high precision 6-axis robot (Stäubli RX family) with controller and software. An arm extension for accommodating the data acquisition electronics (DAE).

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

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

A unit to operate the optical surface detector which is connected to the EOC.

The Electro-Optical Coupler (EOC) performs the conversion from the optical into a digital electric signal of the DAE. The EOC is connected to the DASY5 measurement server.

The DASY5 measurement server, which performs all real-time data evaluation for field measurements and surface detection, controls robot movements and handles safety operation. A computer operating Windows 2003.

DASY5 software and SEMCAD data evaluation software.

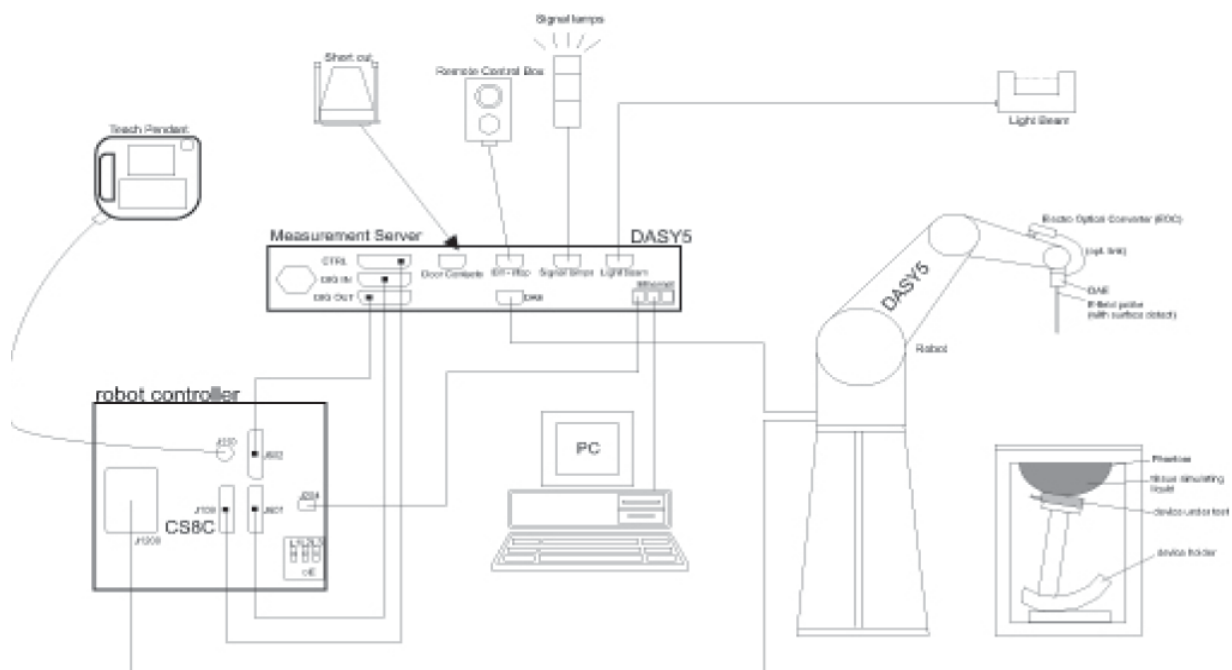
Remote control with teach panel and additional circuitry for robot safety such as warning lamps, etc.

The generic twin phantom enabling the testing of left-hand and right-hand usage.

The device holder for handheld Mobile Phones.

Tissue simulating liquid mixed according to the given recipes.

System validation dipoles allowing to validate the proper functioning of the system.



4.2. DASY5 E-field Probe System

The SAR measurements were conducted with the dosimetric probe EX3DV4 (manufactured by SPEAG), designed in the classical triangular configuration and optimized for dosimetric evaluation.

Probe Specification

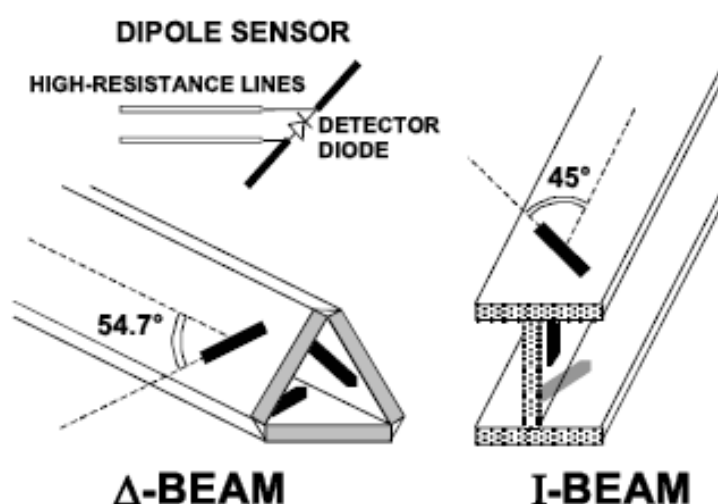
Construction	Symmetrical design with triangular core Interleaved sensors Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Calibration	ISO/IEC 17025 calibration service available.
Frequency	10 MHz to 4 GHz; Linearity: ± 0.2 dB (30 MHz to 4 GHz)
Directivity	± 0.2 dB in HSL (rotation around probe axis) ± 0.3 dB in tissue material (rotation normal to probe axis)
Dynamic Range	5 $\mu\text{W/g}$ to > 100 mW/g; Linearity: ± 0.2 dB
Dimensions	Overall length: 337 mm (Tip: 20 mm) Tip diameter: 3.9 mm (Body: 12 mm) Distance from probe tip to dipole centers: 2.0 mm
Application	General dosimetry up to 4 GHz Dosimetry in strong gradient fields Compliance tests of Mobile Phones
Compatibility	DASY3, DASY4, DASY52 SAR and higher, EASY4/MRI



Isotropic E-Field Probe

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

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



4.3. Phantoms Description

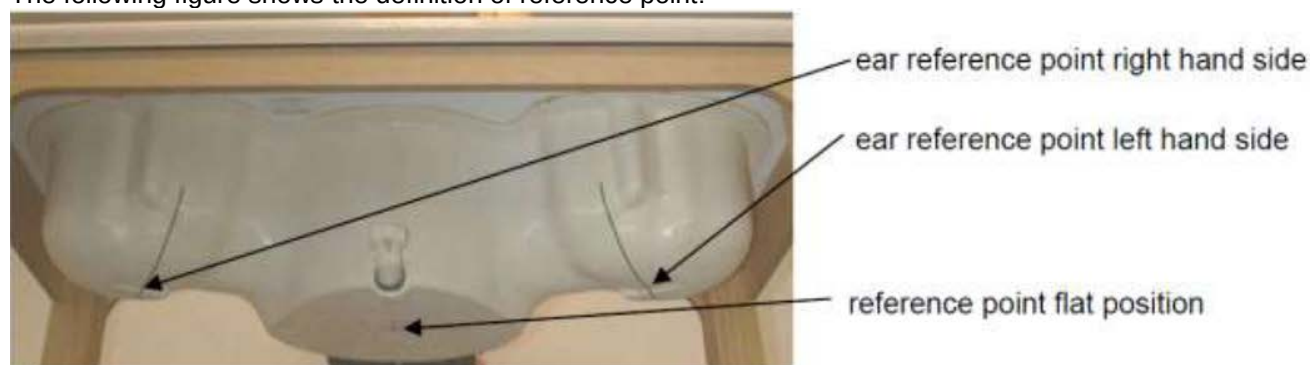
SAM Twin Phantom

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

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

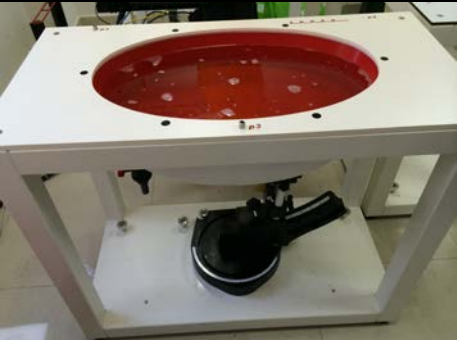
Shell Thickness	2mm +/- 0.2 mm; The ear region: 6mm	
Filling Volume	Approximately 25 liters	
Dimensions	Major axis:600mm; Minor axis:400mm;	
Measurement Areas	Left hand Right hand Flat phantom	
The bottom plate contains three pairs of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections. A white cover is provided to cover the phantom during off-periods to prevent water evaporation and changes in the liquid parameters. Free space scans of devices on top of this phantom cover are possible. Three reference marks are provided on the phantom counter. These reference marks are used to teach the absolute phantom position relative to the robot.		

The following figure shows the definition of reference point:



ELI4 Phantom

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

Shell Thickness	2mm +/- 0.2 mm	
Filling Volume	Approximately 30 liters	
Dimensions	Major axis:600mm; Minor axis:400mm;	
Measurement Areas	Flat phantom	
The ELI4 phantom is intended for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30MHz to 6GHz. ELI4 is fully compatible with the latest draft of the standard IEC 62209-2 and all known tissue simulating liquids.		

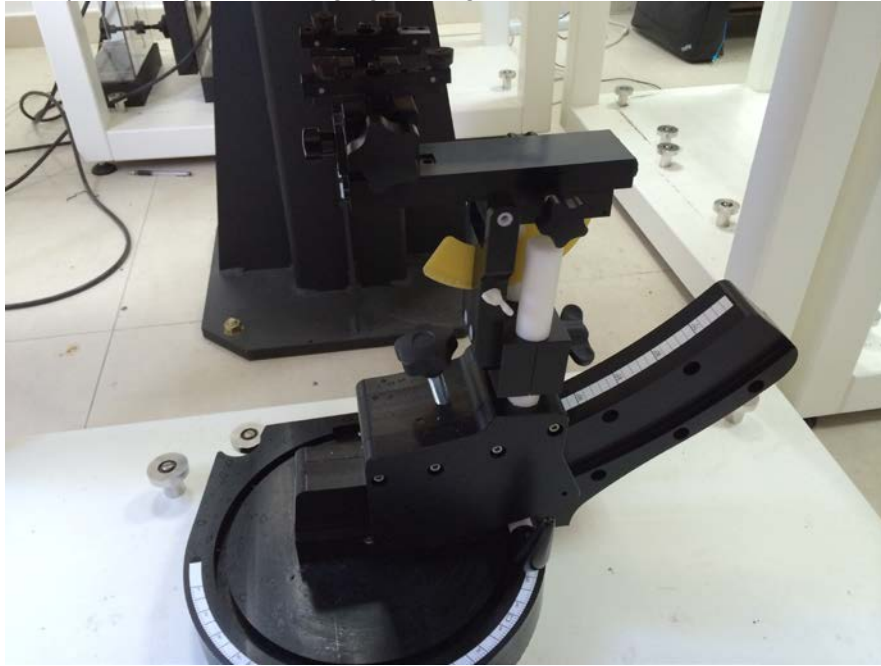
The phantom shell material is resistant to all ingredients used in the tissue-equivalent liquid recipes. The shell of the phantom including ear spacers is constructed from low permittivity and low loss material, with a relative permittivity ≤ 5 and a loss tangent ≤ 0.05 .

4.4. Device Holder

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

The DASY device holder is designed to cope with the different positions given in the standard. It has two scales for device rotation (with respect to the body axis) and device inclination (with respect to the line

between the ear reference points). The rotation centers for both scales is the ear reference point (ERP). Thus the device needs no repositioning when changing the angles.



Device holder supplied by SPEAG

4.5. Scanning Procedure

The DASY5 installation includes predefined files with recommended procedures for measurements and validation. They are read-only document files and destined as fully defined but unmeasured masks. All test positions (head or body-worn) are tested with the same configuration of test steps differing only in the grid definition for the different test positions.

The “reference” and “drift” measurements are located at the beginning and end of the batch process. They measure the field drift at one single point in the liquid over the complete procedure. The indicated drift is mainly the variation of the DUT’s output power and should vary max. $\pm 5\%$.

The “surface check” measurement tests the optical surface detection system of the DASY5 system by repeatedly detecting the surface with the optical and mechanical surface detector and comparing the results. The output gives the detecting heights of both systems, the difference between the two systems and the standard deviation of the detection repeatability. Air bubbles or refraction in the liquid due to separation of the sugar-water mixture gives poor repeatability (above $\pm 0.1\text{mm}$). To prevent wrong results tests are only executed when the liquid is free of air bubbles. The difference between the optical surface detection and the actual surface depends on the probe and is specified with each probe (It does not depend on the surface reflectivity or the probe angle to the surface within $\pm 30^\circ$.)

Area Scan

The Area Scan is used as a fast scan in two dimensions to find the area of high field values before running a detailed measurement around the hot spot. Before starting the area scan a grid spacing of $15\text{ mm} \times 15\text{ mm}$ is set. During the scan the distance of the probe to the phantom remains unchanged. After finishing area scan, the field maxima within a range of 2 dB will be ascertained.

Zoom Scan

Zoom Scans are used to estimate the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of simulated tissue. The default Zoom Scan is done by $7 \times 7 \times 7$ points within a cube whose base is centered around the maxima found in the preceding area scan.

Spatial Peak Detection

The procedure for spatial peak SAR evaluation has been implemented and can determine values of masses of 1g and 10g, as well as for user-specific masses. The DASY5 system allows evaluations that combine measured data and robot positions, such as: • maximum search • extrapolation • boundary correction • peak search for averaged SAR. During a maximum search, global and local maxima searches are automatically performed in 2-D after each Area Scan measurement with at least 6 measurement points. It is based on the evaluation of the local SAR gradient calculated by the Quadratic Shepard’s method. The algorithm will find the global maximum and all local maxima within -2 dB of the global maxima for all SAR distributions.

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. Several measurements at different distances are necessary for the extrapolation. Extrapolation routines require at least 10 measurement points in 3-D space. They are used in the Zoom Scan to obtain SAR values between the lowest measurement points and the inner phantom surface. The routine uses the modified Quadratic Shepard's method for extrapolation. For a grid using 7x7x7 measurement points with 5mm resolution amounting to 343 measurement points, the uncertainty of the extrapolation routines is less than 1% for 1g and 10g cubes.

A Z-axis scan measures the total SAR value at the x-and y-position of the maximum SAR value found during the cube 7x7x7 scan. The probe is moved away in z-direction from the bottom of the SAM phantom in 5mm steps.

The following table summarizes the area scan and zoom scan resolutions:

			≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface			5 mm ±1 mm	$\frac{1}{2} \cdot \delta \cdot \ln(2)$ mm ± 0.5 mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location			30° ± 1°	20° ± 1°
Maximum area scan spatial resolution: Δx _{Area} , Δy _{Area}			≤ 2 GHz: ≤15 mm 2 – 3 GHz: ≤ 12 mm	3 – 4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 10 mm
			When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	
Maximum zoom scan spatial resolution: Δx _{Zoom} , Δy _{Zoom}			≤ 2 GHz: ≤ 8 mm 2 – 3 GHz: ≤ 5 mm*	3 – 4 GHz: ≤ 5 mm* 4 – 6 GHz: ≤ 4 mm*
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: Δz _{Zoom} (n)		≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm
	graded grid	Δ z _{Zoom} (1): between 1 st two points closest to phantom surface	≤ 4 mm	3 – 4 GHz: ≤ 3 mm 4 – 5 GHz: ≤ 2.5 mm 5 – 6 GHz: ≤ 2 mm
		Δ z _{Zoom} (n>1): between subsequent points	≤ 1.5· Δ z _{Zoom} (n-1) mm	
Minimum zoom scan volume	x, y, z		≥ 30 mm	3 – 4 GHz: ≥ 28 mm 4 – 5 GHz: ≥ 25 mm 5 – 6 GHz: ≥ 22 mm
Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see IEEE Std 1528-2013 for details.				
* When zoom scan is required and the reported SAR from the area scan based 1-g SAR estimation procedures of KDB Publication 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.				

4.6. Data Storage and Evaluation

Data Storage

The DASY5 software stores the acquired data from the data acquisition electronics as raw data (in microvolt readings from the probe sensors), together with all necessary software parameters for the data evaluation (probe calibration data, liquid parameters and device frequency and modulation data) in measurement files with the extension ".DA4". The software evaluates the desired unit and format for output each time the data is visualized or exported. This allows verification of the complete software setup even after the measurement and allows correction of incorrect parameter settings. For example, if a measurement has been performed with a wrong crest factor parameter in the device setup, the parameter can be corrected afterwards and the data can be re-evaluated.

The measured data can be visualized or exported in different units or formats, depending on the selected probe type ([V/m], [A/m], [°C], [mW/g], [mW/cm²], [dBrel], etc.). Some of these units are not available in certain situations or show meaningless results, e.g., a SAR output in a lossless media will always be zero. Raw data can also be exported to perform the evaluation with other software packages.

Data Evaluation

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

Probe parameters:	- Sensitivity	Normi, ai0, ai1, ai2
	- Conversion factor	ConvFi
	- Diode compression point	Dcpi
Device parameters:	- Frequency	f
	- Crest factor	cf
Media parameters:	- Conductivity	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 DASY5 components. In the direct measuring mode of the multimeter option, the parameters of the actual system setup are used. In the scan visualization and export modes, the parameters stored in the corresponding document files are used.

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

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

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

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

$$\text{E - fieldprobes : } E_i = \sqrt{\frac{V_i}{\text{Norm}_i \cdot \text{ConvF}}}$$

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

With V_i = compensated signal of channel i (i = x, y, z)
 Norm_i = sensor sensitivity of channel i (i = x, y, z)
 [mV/(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.

$$SAR = E_{tot}^2 \cdot \frac{\sigma}{\rho \cdot 1'000}$$

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/cm³

Note that the density is normally set to 1 (or 1.06), to account for actual brain density rather than the density of the simulation liquid.

4.7. SAR Measurement System

The SAR measurement system being used is the DASY5 system, the system is controlled remotely from a PC, which contains the software to control the robot and data acquisition equipment. The software also displays the data obtained from test scans.

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

4.7.1 Tissue Dielectric Parameters for Head and Body Phantoms

The liquid is consisted of water,salt,Glycol,Sugar,Preventol and Cellulose and DGBE.The liquid has previously been proven to be suited for worst-case. It's satisfying the latest tissue dielectric parameters requirements proposed by the KDB865664.

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

(ϵ_r = relative permittivity, σ = conductivity and ρ = 1000 kg/m³)

4.8. Dielectric Performance

Dielectric performance of Head and Body tissue simulating liquid.

Ingredient (% Weight)	750MHz		835MHz		1900MHz		1750 MHz		2450MHz		2600MHz	
	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body
Water	39.2	50.3	41.45	52.5	55.242	69.91	55.782	69.82	62.7	73.2	62.3	72.6
Salt	2.70	1.6	1.45	1.40	0.306	0.13	0.401	0.12	0.50	0.10	0.20	0.10
Sugar	57.0	47.0	56	45.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Preventol	0.0	0.0	0.10	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HEC	0.0	0.0	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DGBE	0.0	0.0	0.00	0.00	44.452	29.96	43.817	30.06	36.8	26.7	37.5	27.3

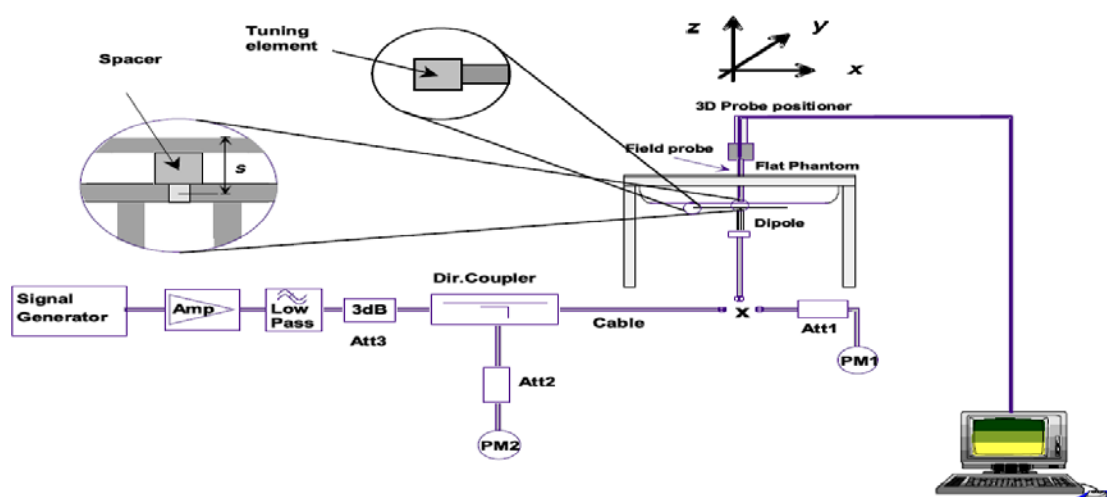
Tissue Type	Measured Frequency (MHz)	Target Tissue		Measured Tissue				Liquid Temp. (degree)	Test Data
		ϵ_r	σ	ϵ_r	Dev. %	σ	Dev. %		
750H	750	42.0	0.89	42.5	1.19%	0.91	2.25%	22.2	2017-07-02
750B	750	55.5	0.96	56.1	1.08%	0.97	1.04%	22.2	2017-07-02
835H	835	41.5	0.90	41.9	0.96%	0.91	1.11%	22.2	2017-06-26
835B	835	55.2	0.97	54.4	-1.45%	0.95	-2.06%	22.2	2017-06-27
1750H	1750	40.1	1.37	40.9	2.00%	1.34	-2.19%	22.2	2017-07-03
1750B	1750	53.4	1.49	52.8	-1.12%	1.45	-2.68%	22.2	2017-07-04
1900H	1900	40.0	1.40	40.8	2.00%	1.43	2.14%	22.2	2017-06-26
1900B	1900	53.3	1.52	54.1	1.50%	1.50	-1.32%	22.2	2017-06-29
2450H	2450	39.2	1.80	39.7	1.28%	1.83	1.67%	22.2	2017-06-26
2450B	2450	52.7	1.95	53.6	1.71%	1.96	0.51%	22.2	2017-07-01

4.9. System Check

The purpose of the system check is to verify that the system operates within its specifications at the device test frequency. The system check is simple check of repeatability to make sure that the system works correctly at the time of the compliance test;

System check results have to be equal or near the values determined during dipole calibration with the relevant liquids and test system (± 10 %).

System check is performed regularly on all frequency bands where tests are performed with the DASY5 system.



The output power on dipole port must be calibrated to 20 dBm (100mW) before dipole is connected.

Justification for Extended SAR Dipole Calibrations

Referring to KDB 865664D01V01r04, if dipoles are verified in return loss ($< -20\text{dB}$, within 20% of prior calibration), and in impedance (within 5 ohm of prior calibration), the annual calibration is not necessary and the calibration interval can be extended. While calibration intervals not exceed 3 years.

D835V2, Serial No.: 4d141 Extend Dipole Calibrations

835MHz Head						
Date of Measurement	Return-Loss (dB)	Delta (%)	Real Impedance (ohm)	Delta (ohm)	Imaginary Impedance (ohm)	Delta (ohm)
2015-09-24	-25.90		48.2		-4.66	
2016-08-22	-27.20	-5.019	49.177	0.977	-4.944	-0.284
835MHz Body						
Date of Measurement	Return-Loss (dB)	Delta (%)	Real Impedance (ohm)	Delta (ohm)	Imaginary Impedance (ohm)	Delta (ohm)
2015-09-24	-22.30		45.70		-5.94	
2016-08-22	-23.50	-5.381	47.836	2.136	-6.447	-0.507

D1900V2, Serial No.: 5d162 Extend Dipole Calibrations

1900MHz Head						
Date of Measurement	Return-Loss (dB)	Delta (%)	Real Impedance (ohm)	Delta (ohm)	Imaginary Impedance (ohm)	Delta (ohm)
2015-09-16	-30.90		51.0		2.72	
2016-08-22	-33.20	-7.443	52.629	1.629	3.422	0.702
1900MHz Body						
Date of Measurement	Return-Loss (dB)	Delta (%)	Real Impedance (ohm)	Delta (ohm)	Imaginary Impedance (ohm)	Delta (ohm)
2015-09-16	-27.30		48.4		3.95	
2016-08-22	-29.70	-8.791	49.915	1.515	4.442	0.492

D2450V2, Serial No.: 818 Extend Dipole Calibrations

2.45GHz Head						
Date of Measurement	Return-Loss (dB)	Delta (%)	Real Impedance (ohm)	Delta (ohm)	Imaginary Impedance (ohm)	Delta (ohm)
2015-09-14	-26.40		52.00		4.41	
2016-08-22	-26.80	-1.515	52.564	0.564	4.678	0.268
2.45GHz Body						
Date of Measurement	Return-Loss (dB)	Delta (%)	Real Impedance (ohm)	Delta (ohm)	Imaginary Impedance (ohm)	Delta (ohm)
2015-09-14	-26.40		49.40		4.75	
2016-08-22	-27.10	-2.652	50.316	0.916	4.866	0.116

System Check in Head Tissue Simulating Liquid

Frequency	Test Date	Dielectric Parameters		Temp	100mW Measured	1W Normalized	1W Target	Limit ($\pm 10\%$ Deviation)
		ϵ_r	σ (s/m)					
750 MHz	2017-07-02	42.5	0.91	22.2	0.838	8.38	8.26	1.43%
835 MHz	2017-06-26	41.9	0.91	22.2	0.972	9.72	9.45	2.86%
1750 MHz	2017-07-03	40.9	1.34	22.2	3.56	35.6	36.7	-2.99%
1900 MHz	2017-06-26	40.8	1.43	22.2	4.16	41.6	40.4	2.97%
2450 MHz	2017-06-26	39.7	1.83	22.2	5.24	52.4	52.7	-0.57%

System Check in Body Tissue Simulating Liquid

Frequency	Test Date	Dielectric Parameters		Temp	100mW Measured	1W Normalized	1W Target	Limit ($\pm 10\%$ Deviation)
		ϵ_r	σ (s/m)					
750 MHz	2017-07-02	56.1	0.97	22.2	0.856	8.56	8.58	-0.23%
835 MHz	2017-06-27	51.4	0.95	22.2	0.977	9.77	9.51	2.73%
1750 MHz	2017-07-04	52.8	1.45	22.2	3.68	36.8	37.6	-2.13%
1900 MHz	2017-06-29	54.1	1.50	22.2	4.22	42.2	41.2	2.43%
2450 MHz	2017-07-01	53.6	1.96	22.2	5.21	52.1	51.1	1.96%

4.10. Measurement Procedures

Tests to be performed

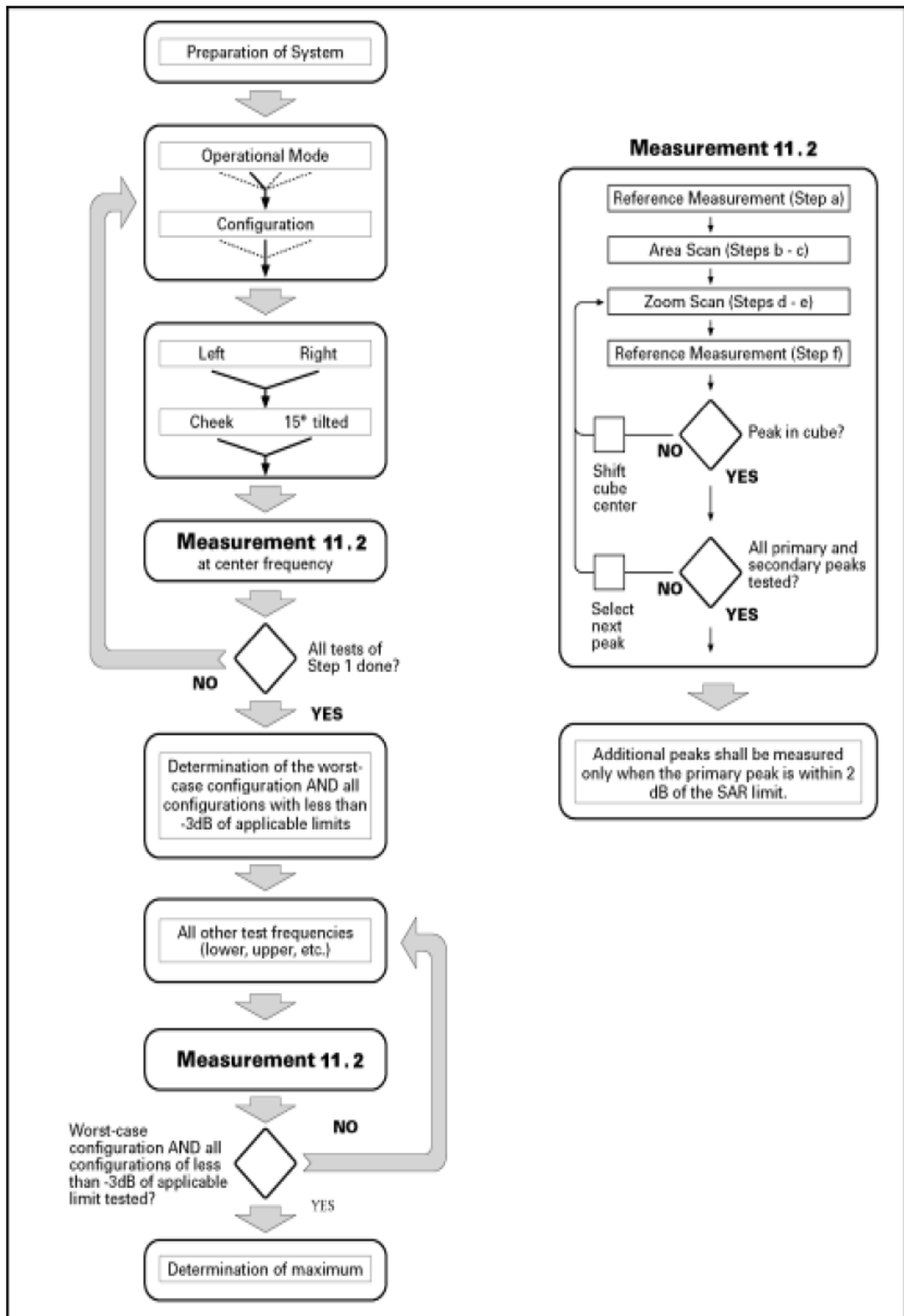
In order to determine the highest value of the peak spatial-average SAR of a handset, all device positions, configurations and operational modes shall be tested for each frequency band according to steps 1 to 3 below. A flowchart of the test process is shown in Picture 11

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

- all device positions (cheek and tilt, for both left and right sides of the SAM phantom, as described in Chapter 8),
- all configurations for each device position in a), e.g., antenna extended and retracted, and
- all operational modes, e.g., analogue and digital, for each device position in a) and configuration in b) in each frequency band.
- If more than three frequencies need to be tested according to 11.1 (i.e., $N_c > 3$), then all frequencies, configurations and modes shall be tested for all of the above test conditions.

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

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



Picture 11 Block diagram of the tests to be performed

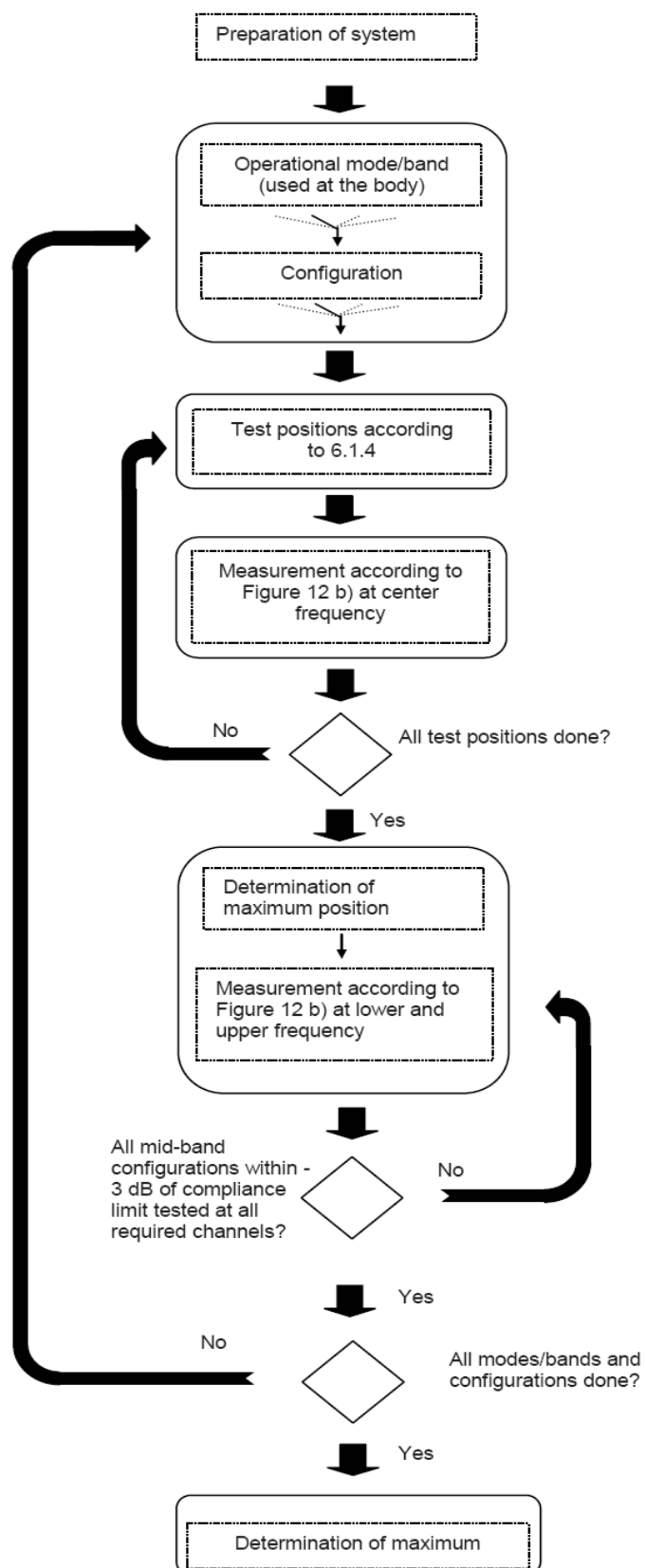


Figure 12a – Tests to be performed

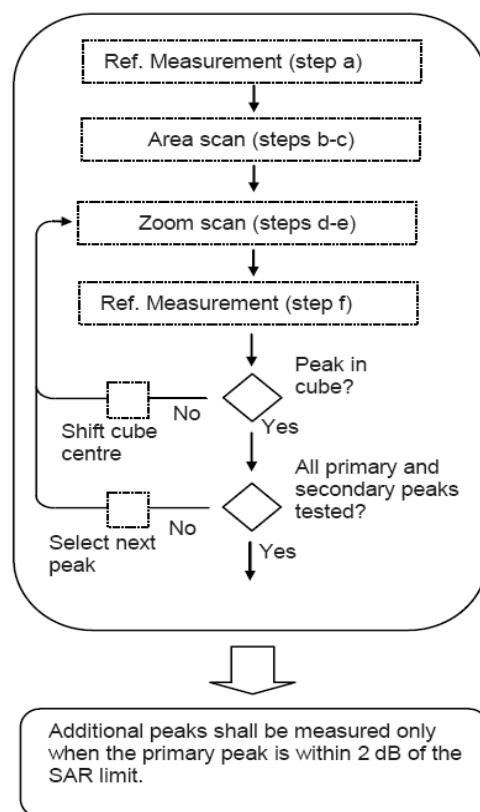


Figure 12b – General procedure

Picture 12 Block diagram of the tests to be performed

Measurement procedure

The following procedure shall be performed for each of the test conditions (see Picture 11) described in 11.1:

- Measure the local SAR at a test point within 8 mm or less in the normal direction from the inner surface of the phantom.
- Measure the two-dimensional SAR distribution within the phantom (area scan procedure). The boundary of the measurement area shall not be closer than 20 mm from the phantom side walls. The distance between the measurement points should enable the detection of the location of local maximum with an

accuracy of better than half the linear dimension of the tissue cube after interpolation. A maximum grip spacing of 20 mm for frequencies below 3 GHz and $(60/f \text{ [GHz]})$ mm for frequencies of 3 GHz and greater is recommended. The maximum distance between the geometrical centre of the probe detectors and the inner surface of the phantom shall be 5 mm for frequencies below 3 GHz and $\delta \ln(2)/2$ mm for frequencies of 3 GHz and greater, where δ is the plane wave skin depth and $\ln(x)$ is the natural logarithm. The maximum variation of the sensor-phantom surface shall be ± 1 mm for frequencies below 3 GHz and ± 0.5 mm for frequencies of 3 GHz and greater. At all measurement points the angle of the probe with respect to the line normal to the surface should be less than 5° . If this cannot be achieved for a measurement distance to the phantom inner surface shorter than the probe diameter, additional measurement distance to the phantom inner surface shorter than the probe diameter, additional

- c) From the scanned SAR distribution, identify the position of the maximum SAR value, in addition identify the positions of any local maxima with SAR values within 2 dB of the maximum value that are not within the zoom-scan volume; additional peaks shall be measured only when the primary peak is within 2 dB of the SAR limit. This is consistent with the 2 dB threshold already stated;
- d) Measure the three-dimensional SAR distribution at the local maxima locations identified in step
- e) The horizontal grid step shall be $(24 / f[\text{GHz}])$ mm or less but not more than 8 mm. The minimum zoom size of 30 mm by 30 mm and 30 mm for frequencies below 3 GHz. For higher frequencies, the minimum zoom size of 22 mm by 22 mm and 22 mm. The grip step in the vertical direction shall be $(8-f[\text{GHz}])$ mm or less but not more than 5 mm, if uniform spacing is used. If variable spacing is used in the vertical direction, the maximum spacing between the two closest measured points to the phantom shell shall be $(12 / f[\text{GHz}])$ mm or less but not more than 4 mm, and the spacing between father points shall increase by an incremental factor not exceeding 1.5. When variable spacing is used, extrapolation routines shall be tested with the same spacing as used in measurements. The maximum distance between the geometrical centre of the probe detectors and the inner surface of the phantom shall be 5 mm for frequencies below 3 GHz and $\delta \ln(2)/2$ mm for frequencies of 3 GHz and greater, where δ is the plane wave skin depth and $\ln(x)$ is the natural logarithm. Separate grids shall be centered on each of the local SAR maxima found in step c). Uncertainties due to field distortion between the media boundary and the dielectric enclosure of the probe should also be minimized, which is achieved is the distance between the phantom surface and physical tip of the probe is larger than probe tip diameter. Other methods may utilize correction procedures for these boundary effects that enable high precision measurements closer than half the probe diameter. For all measurement points, the angle of the probe with respect to the flat phantom surface shall be less than 5° . If this cannot be achieved an additional uncertainty evaluation is needed.
- f) Use post processing(e.g. interpolation and extrapolation) procedures to determine the local SAR values at the spatial resolution needed for mass averaging.

Measurement procedure

The following procedure shall be performed for each of the test conditions (see Picture 11) described in 11.1:

- g) Measure the local SAR at a test point within 8 mm or less in the normal direction from the inner surface of the phantom.
- h) Measure the two-dimensional SAR distribution within the phantom (area scan procedure). The boundary of the measurement area shall not be closer than 20 mm from the phantom side walls. The distance between the measurement points should enable the detection of the location of local maximum with an accuracy of better than half the linear dimension of the tissue cube after interpolation. A maximum grip spacing of 20 mm for frequencies below 3 GHz and $(60/f \text{ [GHz]})$ mm for frequencies of 3 GHz and greater is recommended. The maximum distance between the geometrical centre of the probe detectors and the inner surface of the phantom shall be 5 mm for frequencies below 3 GHz and $\delta \ln(2)/2$ mm for frequencies of 3 GHz and greater, where δ is the plane wave skin depth and $\ln(x)$ is the natural logarithm. The maximum variation of the sensor-phantom surface shall be ± 1 mm for frequencies below 3 GHz and ± 0.5 mm for frequencies of 3 GHz and greater. At all measurement points the angle of the probe with respect to the line normal to the surface should be less than 5° . If this cannot be achieved for a measurement distance to the phantom inner surface shorter than the probe diameter, additional measurement distance to the phantom inner surface shorter than the probe diameter, additional
- i) From the scanned SAR distribution, identify the position of the maximum SAR value, in addition identify the positions of any local maxima with SAR values within 2 dB of the maximum value that are not within the zoom-scan volume; additional peaks shall be measured only when the primary peak is within 2 dB of the SAR limit. This is consistent with the 2 dB threshold already stated;
- j) Measure the three-dimensional SAR distribution at the local maxima locations identified in step
- k) The horizontal grid step shall be $(24 / f[\text{GHz}])$ mm or less but not more than 8 mm. The minimum zoom size of 30 mm by 30 mm and 30 mm for frequencies below 3 GHz. For higher frequencies, the minimum zoom size of 22 mm by 22 mm and 22 mm. The grip step in the vertical direction shall be $(8-f[\text{GHz}])$ mm or less but not more than 5 mm, if uniform spacing is used. If variable spacing is used in the vertical direction, the maximum spacing between the two closest measured points to the phantom shell shall be $(12 / f[\text{GHz}])$ mm or less but not more than 4 mm, and the spacing between father points shall increase by an incremental factor not exceeding 1.5. When variable spacing is used, extrapolation routines shall be tested with the same spacing as used in measurements. The maximum distance between the geometrical

centre of the probe detectors and the inner surface of the phantom shall be 5 mm for frequencies below 3 GHz and $\delta \ln(2)/2$ mm for frequencies of 3 GHz and greater, where δ is the plane wave skin depth and $\ln(x)$ is the natural logarithm. Separate grids shall be centered on each of the local SAR maxima found in step c). Uncertainties due to field distortion between the media boundary and the dielectric enclosure of the probe should also be minimized, which is achieved if the distance between the phantom surface and physical tip of the probe is larger than probe tip diameter. Other methods may utilize correction procedures for these boundary effects that enable high precision measurements closer than half the probe diameter. For all measurement points, the angle of the probe with respect to the flat phantom surface shall be less than 5°. If this cannot be achieved an additional uncertainty evaluation is needed.

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

4.11. Operational Conditions during Test

4.11.1. General Description of Test Procedures

The sample enter into 100% duty cycle continuous transmit controlled by engineer mode (*##3646433##) provided by application.

For WWAN power measurement, use base station simulator connection with RF cable, at maximum power in each supported wireless interface and frequency band.

Read the WWAN RF power level from the base station simulator.

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

4.12. Position of the wireless device in relation to the phantom

4.12.1 Head Configuration

Measurements were made in Check and Tilt positions on both the left hand and right hand sides of the phantom.

The positions used in the measurements for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless communications devices.

4.12.2 Body Configuration

The overall diagonal dimension of the display section of a tablet is 20.7 cm > 20 cm, Per FCC KDB 616217 Tablet host platform test requirements, the back surface and edges of the tablet should be tested for SAR compliance with the tablet touching the phantom. Exposures from antennas through the front (top) surface of the display section of a full-size tablet, away from the edges, are generally limited to the user's hands. Exposures to hands for typical consumer transmitters used in tablets are not expected to exceed the extremity SAR limit; therefore, SAR evaluation for the front surface of tablet display screens are generally not necessary, except for tablets that are designed to require continuous operations with the hand(s) next to the antenna(s). Per KDB 648474 SAR Evaluation Considerations for Wireless Handsets, when the over diagonal dimension of the device is > 20.0 cm. Hotspot mode SAR is not required when normal tablet procedures are applied. Extremity 10-g SAR is also not required for the front (top) surface of large form factor full size tablets. The more conservative tablet SAR results can be used to supported the 10-g extremity SAR for phablet mode.

- Test Position 1: The rear surface of the EUT towards the bottom of the flat phantom;
- Test Position 2: The left surface of the EUT towards the bottom of the flat phantom;
- Test Position 3: The right surface of the EUT towards the bottom of the flat phantom;
- Test Position 4: The top surface of the EUT towards the bottom of the flat phantom;
- Test Position 5: The bottom surface of the EUT towards the bottom of the flat phantom;

4.12.3 SAM Phantom Limitations Configuration

The antennas of recent generation phones are typically incorporated near the sides and along edges of the phone. Occasionally, a phone with antennas located near the bottom or lower side edges may have peak SAR locations near the mouth and jaw regions or along the steep curved surfaces of the SAM phantom where SAR probe access is not feasible with a horizontally configured SAM phantom. It has been known for some time that there are also other SAR measurement difficulties in the tight regions of the SAM phantom with no easy solution. SAR probes are calibrated in tissue-equivalent medium with sufficient separation between the probe sensors and nearby physical boundaries to ensure field scattering does not affect the probe calibration. When the probe tip is positioned in tight areas, such as in the mouth and jaw regions of the SAM phantom,

with multiple boundaries surrounding the probe sensors, the probe calibration and measurement accuracy can become questionable. In addition, measurements near these locations with steep curvatures may require a probe to be tilted at steep angles that may no longer comply with the required calibration requirements and measurement protocols for maintaining measurement accuracy and uncertainty. For some situations, it is just not feasible to tilt the probe without using a rotated SAM phantom that are specifically constructed to enable probe access below the cheek and near the jaw area.¹¹ When a rotated SAM phantom is not used, the measured SAR distribution is often clipped and showing only part of the SAR distribution under consideration.

4.13. Test Configuration

4.13.1 GSM Test Configuration

SAR tests for GSM 850 and GSM 1900, a communication link is set up with a System Simulator (SS) by air link. Using CMU200 the power level is set to “5” for GSM 850, set to “0” for GSM 1900. Since the GPRS class is 12 for this EUT, it has at most 4 timeslots in uplink and at most 4 timeslots in downlink, the maximum total timeslots is 5. the EGPRS class is 12 for this EUT, it has at most 4 timeslots in uplink and at most 4 timeslots in downlink, the maximum total timeslots is 5.

SAR test reduction for GPRS and EDGE modes is determined by the source-based time-averaged output power specified for production units, including tune-up tolerance. The data mode with highest specified time-averaged output power should be tested for SAR compliance in the applicable exposure conditions. For modes with the same specified maximum output power and tolerance, the higher number time-slot configuration should be tested. GSM voice and GPRS data use GMSK, which is a constant amplitude modulation with minimal peak to average power difference within the time-slot burst. For EDGE, GMSK is used for MCS 1 – MCS 4 and 8-PSK is used for MCS 5 – MCS 9; where 8-PSK has an inherently higher peak-to-average power ratio. The GMSK and 8-PSK EDGE configurations are considered separately for SAR compliance. The GMSK EDGE configurations are grouped with GPRS and considered with respect to time-averaged maximum output power to determine compliance. The 3G SAR test reduction procedure is applied to 8-PSK EDGE with GMSK GPRS/EDGE as the primary mode.

According to specification 3GPP TS 51.010, the maximum power of the GSM can do the power reduction for the multi-slot. The allowed power reduction in the multi-slot configuration is as following: Output power of reductions:

The allowed power reduction in the multi-slot configuration

Number of timeslots in uplink assignment	Permissible nominal reduction of maximum output power, (dB)
1	0
2	0 to 3.0
3	1.8 to 4.8
4	3.0 to 6.0

4.13.2. UMTS Test Configuration

4.13.2.1. Output power Verification

Maximum output power is verified on the High, Middle and Low channel according to the procedures described in section 5.2 of 3GPP TS 34. 121, using the appropriate RMC or AMR with TPC(transmit power control) set to all up bits for WCDMA/HSDPA or applying the required inner loop power control procedures to the maximum output power while HSUPA is active. Results for all applicable physical channel configuration (DPCCH, DPDCH_n and spreading codes, HSDPA, HSPA) should be tabulated in the SAR report. All configuration that are not supported by the DUT or can not be measured due to technical or equipment limitations should be clearly identified.

4.13.2.2. Head SAR Measurements

SAR for head exposure configurations in voice mode is measured using a 12.2kbps RMC with TPC bits configured to all up bits. SAR in AMR configurations is not required when the maximum average output of each RF channel for 12.2kbps AMR is less than 1/4 dB higher than that measured in 12.2 kbps RMC. Otherwise, SAR is measured on the maximum output channel in 12.2kbps AMR with a 3.4 kbps SRB(Signaling radio bearer) using the exposure configuration that results in the highest SAR in 12.2kbps RMC for that RF channel.

4.13.2.3. Body SAR Measurements

SAR for body exposure configurations in voice and data modes is measured using 12.2kbps RMC with TPC bits configured to all up bits. SAR for other spreading codes and multiple DPDCH_n, when supported by the DUT, are not required when the maximum average output of each RF channel, for each spreading code and DPDCH_n configuration, are less than 1/4 dB higher than those measured in 12.2kbps RMC. Otherwise, SAR is measured on the maximum output channel with an applicable RMC configuration for the corresponding spreading code or DPDCH_n using the exposure configuration that results in the highest SAR with 12.2 kbps RMC. When more than 2 DPDCH_n are supported by the DUT, it may be necessary to configure additional DPDCH_n for a DUT using FTM (Factory Test Mode) or other chipset based test approaches with parameters similar to those used in 384 kbps and 768 kbps RMC.

4.13.2.4 Handsets with Release 5 HSDPA

The 3G SAR test reduction procedure is applied to HSDPA body-worn accessory configurations with 12.2 kbps RMC as the primary mode. Otherwise, SAR is measured for HSDPA using the HSDPA body SAR procedures in the "Release 5 HSDPA Data Devices" section of this document, for the highest reported SAR body-worn accessory exposure configuration in 12.2 kbps RMC. Handsets with both HSDPA and HSUPA are tested according to Release 6 HSPA test procedures.

HSDPA should be configured according to the UE category of a test device. The number of HSDSCH/ HS-PDSCHs, HARQ processes, minimum inter-TTI interval, transport block sizes and RV coding sequence are defined by the H-set. To maintain a consistent test configuration and stable transmission conditions, QPSK is used in the H-set for SAR testing. HS-DPCCH should be configured with a CQI feedback cycle of 4 ms with a CQI repetition factor of 2 to maintain a constant rate of active CQI slots. DPCCH and DPDCH gain factors (β_c , β_d), and HS-DPCCH power offset parameters (Δ_{ACK} , Δ_{NACK} , Δ_{CQI}) should be set according to values indicated in the Table below. The CQI value is determined by the UE category, transport block size, number of HS-PDSCHs and modulation used in the H-set.

Table 2: Subtests for UMTS Release 5 HSDPA

Sub-set	β_c	β_d	β_d (SF)	β_c/β_d	β_{hs} (note 1, note 2)	CM(dB) (note 3)	MPR(dB)
1	2/15	15/15	64	2/15	4/15	0.0	0.0
2	12/15 (note 4)	15/15 (note 4)	64	12/15 (note 4)	24/15	1.0	0.0
3	15/15	8/15	64	15/8	30/15	1.5	0.5
4	15/15	4/15	64	15/4	30/15	1.5	0.5
Note1: Δ_{ACK}, Δ_{NACK} and $\Delta_{CQI} = 8 \Leftrightarrow A_{hs} = \beta_{hs}/\beta_c = 30/15 \Leftrightarrow \beta_{hs} = 30/15 * \beta_c$ Note2: CM=1 for $\beta_c/\beta_d = 12/15$, $\beta_{hs}/\beta_c = 24/15$. Note3: 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 (TFC1, TF1) to $\beta_c = 11/15$ and $\beta_d = 15/15$.							

4.13.2.5 HSUPA Test Configuration

The 3G SAR test reduction procedure is applied to HSPA (HSUPA/HSDPA with RMC) body-worn accessory configurations with 12.2 kbps RMC as the primary mode. Otherwise, SAR is measured for HSPA using the HSPA body SAR procedures in the "Release 6 HSPA Data Devices" section of this document, for the highest reported body-worn accessory exposure SAR configuration in 12.2 kbps RMC. When VOIP is applicable for next to the ear head exposure in HSPA, the 3G SAR test reduction procedure is applied to HSPA with 12.2 kbps RMC as the primary mode; otherwise, the same HSPA configuration used for body-worn accessory measurements is tested for next to the ear head exposure.

Due to inner loop power control requirements in HSPA, a communication test set is required for output power and SAR tests. The 12.2 kbps RMC, FRC H-set 1 and E-DCH configurations for HSPA are configured according to the β values indicated in Table 2 and other applicable procedures described in the 'WCDMA Handset' and 'Release 5 HSDPA Data Devices' sections of this document

Table 3: Sub-Test 5 Setup for Release 6 HSUPA

Sub-set	β_c	β_d	β_d (SF)	β_c/β_d	$\beta_{hs}^{(1)}$	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	$\beta_{ed1}:47/15$ $\beta_{ed2}:47/15$	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 $\Delta_{CQI} = 8 \Leftrightarrow A_{hs} = \beta_{hs}/\beta_c = 30/15 \Leftrightarrow \beta_{hs} = 30/15 * \beta_c$.

Note 2: CM = 1 for $\beta_c/\beta_d = 12/15$, $\beta_{hs}/\beta_c = 24/15$. 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 $\beta_c = 10/15$ and $\beta_d = 15/15$.

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 $\beta_c = 14/15$ and $\beta_d = 15/15$.

Note 5: Testing UE using E-DPDCH Physical Layer category 1 Sub-test 3 is not required according to TS 25.306 Figure 5.1g.

Note 6: β_{ed} can not be set directly; it is set by Absolute Grant Value.

Table 4: HSUPA UE category

UE E-DCH Category	Maximum E-DCH Codes Transmitted	Number of HARQ Processes	E-DCH TTI (ms)	Minimum Spreading Factor	Maximum E-DCH Transport Block Bits	Max Rate (Mbps)
1	1	4	10	4	7110	0.7296
2	2	8	2	4	2798	1.4592
	2	4	10	4	14484	
3	2	4	10	4	14484	1.4592
4	2	8	2	2	5772	2.9185
	2	4	10	2	20000	2.00
5	2	4	10	2	20000	2.00
6 (No DPDCH)	4	8	2	2 SF2 & 2 SF4	11484	5.76
	4	4	10		20000	2.00
7 (No DPDCH)	4	8	2	2 SF2 & 2 SF4	22996	?
	4	4	10		20000	?

NOTE: When 4 codes are transmitted in parallel, two codes shall be transmitted with SF2 and two with SF4. UE Categories 1 to 6 supports QPSK only. UE Category 7 supports QPSK and 16QAM. (TS25.306-7.3.0)

4.13.2.6 HSPA, HSPA+ and DC-HSDPA Test Configuration

measurement is required for HSPA, HSPA+ or DC-HSDPA, a KDB inquiry is required to confirm that the wireless mode configurations in the test setup have remained stable throughout the SAR measurements.³⁵ Without prior KDB confirmation to determine the SAR results are acceptable, a PBA is required for TCB approval.

SAR test exclusion for HSPA, HSPA+ and DC-HSDPA is determined according to the following:

- 1) The HSPA procedures are applied to configure 3GPP Rel. 6 HSPA devices in the required sub-test mode(s) to determine SAR test exclusion.
- 2) SAR is required for Rel. 7 HSPA+ when SAR is required for Rel. 6 HSPA; otherwise, the 3G SAR test reduction procedure is applied to (uplink) HSPA+ with 12.2 kbps RMC as the primary mode.³⁶ Power is measured for HSPA+ that supports uplink 16 QAM according to configurations in Table C.11.1.4 of 3GPP TS 34.121-1 to determine SAR test reduction.
- 3) SAR is required for Rel. 8 DC-HSDPA when SAR is required for Rel. 5 HSDPA; otherwise, the 3G SAR test reduction procedure is applied to DC-HSDPA with 12.2 kbps RMC as the primary mode. Power is measured for DC-HSDPA according to the H-Set 12, FRC configuration in Table C.8.1.12 of 3GPP TS 34.121-1 to determine SAR test reduction. A primary and a secondary serving HS-DSCH Cell are required to perform the power measurement and for the results to be acceptable.
- 4) Regardless of whether a PBA is required, the following information must be verified and included in the SAR report for devices supporting HSPA, HSPA+ or DC-HSDPA: a) The output power measurement results and applicable release version(s) of 3GPP TS 34.121.

i) Power measurement difficulties due to test equipment setup or availability must be resolved between the grantee and its test lab.

b) The power measurement results are in agreement with the individual device implementation and specifications. When Enhanced MPR (E-MPR) applies, the normal MPR targets may be modified according to the Cubic Metric (CM) measured by the device, which must be taken into consideration.

c) The UE category, operating parameters, such as the β and Δ values used to configure the device for testing, power setback procedures described in 3GPP TS 34.121 for the power measurements, and HSPA/HSPA+ channel conditions (active and stable) for the entire duration of the measurement according to the required E-TFCI and AG index values.

5) When SAR measurement is required, the test configurations, procedures and power measurement results must be clearly described to confirm that the required test parameters are used, including E-TFCI and AG index stability and output power conditions.

Table 5: HS-DSCH UE category
Table 5.1a: FDD HS-DSCH physical layer categories

HS-DSCH category	Maximum number of HS-DSCH codes received	Minimum inter-TTI interval	Maximum number of bits of an HS-DSCH transport block received within an HS-DSCH TTI NOTE 1	Total number of soft channel bits	Supported modulations without MIMO operation or dual cell operation	Supported modulations with MIMO operation and without dual cell operation	Supported modulations with dual cell operation	
Category 1	5	3	7298	19200	QPSK, 16QAM	Not applicable (MIMO not supported)	Not applicable (dual cell operation not supported)	
Category 2	5	3	7298	28800				
Category 3	5	2	7298	28800				
Category 4	5	2	7298	38400				
Category 5	5	1	7298	57600				
Category 6	5	1	7298	67200				
Category 7	10	1	14411	115200				
Category 8	10	1	14411	134400				
Category 9	15	1	20251	172800				
Category 10	15	1	27952	172800				
Category 11	5	2	3630	14400				QPSK
Category 12	5	1	3630	28800				
Category 13	15	1	35280	259200				QPSK, 16QAM, 64QAM
Category 14	15	1	42192	259200				
Category 15	15	1	23370	345600	QPSK, 16QAM			
Category 16	15	1	27952	345600				
Category 17 NOTE 2	15	1	35280	259200	QPSK, 16QAM, 64QAM	–		
			23370	345600	–	QPSK, 16QAM		
Category 18 NOTE 3	15	1	42192	259200	QPSK, 16QAM, 64QAM	–		
			27952	345600	–	QPSK, 16QAM		
Category 19	15	1	35280	518400	QPSK, 16QAM, 64QAM			
Category 20	15	1	42192	518400				
Category 21	15	1	23370	345600	-	-	QPSK, 16QAM	
Category 22	15	1	27952	345600				
Category 23	15	1	35280	518400				
Category 24	15	1	42192	518400			QPSK, 16QAM, 64QAM	

4.13.2.7 HSPA, HSPA+ and DC-HSDPA Test Configuration

4.13.2.7.1 Frequency range and channel bandwidth

The frequency range and channel bandwidths (1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, and 20 MHz) used in each LTE band must be listed. When multiple channel bandwidths are available in a frequency band and if the channel selection is unclear, a KDB inquiry may be necessary. If a transmission band is > 100 MHz, the channel selection criteria in 4.1 g) of KDB Publication 447498 D01 must be applied; otherwise, the high, middle, and low (H, M, L) channel should be used.³ These are referred to in this document as the required test channels. The channel numbers and channel frequencies for each channel bandwidth configuration and frequency band must be clearly identified in the test report.

4.13.2.7.2 LTE transmitter and antenna implementation

The LTE transmitter and antenna implementation must be described to support the SAR test setup. It should be clearly identified if the transmitter operates independently of the other wireless transmitters in the device; i.e., whether the LTE hardware, components and/or antenna(s) are shared with other transmitters, to support the simultaneous transmission configurations. The voice and data transmission requirements for all LTE operating modes and exposure conditions, for standalone and simultaneous transmission, with respect to the required head and body test configurations, antenna locations, device and accessory operations, antenna diversity requirements, etc., must be clearly identified. The LTE test procedures must be applied separately to each device operating configuration and exposure condition, in each frequency band; for example, the different test positions required for head SAR and the various surfaces and edges required by the published RF exposure KDB procedures.

4.13.2.7.3 Spectrum plots for RB configurations

When a properly configured basestation simulator is not used for the SAR or power measurements, spectrum plots for each RB allocation and offset configuration should be included in the SAR report to demonstrate that the tested RB allocations have been correctly established at the maximum output power conditions.

4.13.2.7.4 Largest channel bandwidth standalone SAR test requirements

4.13.2.7.4.1 QPSK with 1 RB allocation

Start with the largest channel bandwidth then measure SAR for QPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power among RB offsets at the upper edge, middle, and lower edge of each required test channel. When the reported SAR is ≤ 0.8 W/kg, testing of the remaining RB offset configurations and required test channels is not required for 1 RB allocation; otherwise, SAR is required for the remaining required test channels and only for the RB offset configuration with the highest output power for that channel. When the reported SAR of a required test channel is > 1.45 W/kg, SAR is required for all three RB offset configurations for that required test channel.

4.13.2.7.4.2 QPSK with 50% RB allocation

The procedures required for 1 RB allocation in 5.2.1 are applied to measure the SAR for QPSK with 50% RB allocation.

4.13.2.7.4.3 QPSK with 100% RB allocation

For QPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations, and the highest reported SAR for 1 RB and 50% RB allocation in 5.2.1 and 5.2.2 are ≤ 0.8 W/kg. Otherwise, SAR is measured for the highest output power channel; and if the reported SAR is > 1.45 W/kg, the remaining required test channels must also be tested.

4.13.2.7.4.4 Higher order modulations

For each modulation besides QPSK; e.g., 16-QAM, 64-QAM, apply the QPSK procedures in 5.2.1, 5.2.2, and 5.2.3 to determine the QAM configurations that may need SAR measurement. For each configuration identified as required for testing, SAR is required only when the highest maximum output power for the configuration in the higher order modulation is $> \frac{1}{2}$ dB higher than the same configuration in QPSK or when the reported SAR for the QPSK configuration is > 1.45 W/kg.

4.13.2.7.4.5 Other channel bandwidth standalone SAR test requirements

For the other channel bandwidths used by the device in a frequency band, apply all the procedures required for the largest channel bandwidth in 5.2 to determine the channels and RB configurations that need SAR testing, then only measure SAR when the highest maximum output power of a configuration requiring testing in the smaller channel bandwidth is $> \frac{1}{2}$ dB higher than the equivalent channel configurations in the largest channel bandwidth configuration, or the reported SAR of a configuration for the largest channel bandwidth is > 1.45 W/kg. The equivalent channel configuration for the RB allocation, RB offset and modulation, etc., is determined for the smaller channel bandwidth according to the same number of RB allocated in the largest channel bandwidth. For example, 50 RB in 10 MHz channel bandwidth does not apply to 5 MHz channel bandwidth; therefore, this cannot be tested in the smaller channel bandwidth. However, 50% RB allocation in 10 MHz channel bandwidth is equivalent to 100% RB allocation in 5 MHz channel bandwidth; therefore, these are the equivalent configurations to be compared to determine the specific channel and configuration in the smaller channel bandwidth that need SAR testing.

4.13.3. WLAN Test Configuration

For WiFi SAR testing, WiFi engineering testing software installed on the DUT can provide continuous transmitting RF signal. This RF signal utilized in SAR measurement has almost 100% duty cycle and its crest factor is 1.

The SAR measurement and test reduction procedures are structured according to either the DSSS or OFDM transmission mode configurations used in each standalone frequency band and aggregated band. For devices that operate in exposure configurations that require multiple test positions, additional SAR test reduction may be applied. The maximum output power specified for production units, including tune-up tolerance, are used to determine initial SAR test requirements for the 802.11 transmission modes in a frequency band. SAR is measured using the highest measured maximum output power channel for the initial test configuration. SAR measurement and test reduction for the remaining 802.11 modes and test channels are determined according to measured or specified maximum output power and reported SAR of the initial measurements. The general test reduction and SAR measurement approaches are summarized in the following:

1. The maximum output power specified for production units are determined for all applicable 802.11 transmission modes in each standalone and aggregated frequency band. Maximum output power is measured for the highest maximum output power configuration(s) in each frequency band according to the default power measurement procedures.
2. For OFDM transmission configurations in the 2.4 GHz and 5 GHz bands, an "initial test configuration" is first determined for each standalone and aggregated frequency band according to the maximum output power and tune-up tolerance specified for production units.
 - a. When the same maximum power is specified for multiple transmission modes in a frequency band, the largest channel bandwidth, lowest order modulation, lowest data rate and lowest order 802.11a/g/n/ac mode is used for SAR measurement, on the highest measured output power channel in the initial test configuration, for each frequency band.
 - b. SAR is measured for OFDM configurations using the initial test configuration procedures. Additional frequency band specific SAR test reduction may be considered for individual frequency bands
 - c. Depending on the reported SAR of the highest maximum output power channel tested in the initial test configuration, SAR test reduction may apply to subsequent highest output channels in the initial test configuration to reduce the number of SAR measurements.
3. The Initial test configuration does not apply to DSSS. The 2.4 GHz band SAR test requirements and 802.11b DSSS procedures are used to establish the transmission configurations required for SAR measurement.
4. An "initial test position" is applied to further reduce the number of SAR tests for devices operating in next to the ear, UMPC mini-tablet mode exposure configurations that require multiple test positions.
 - a. SAR is measured for 802.11b according to the 2.4 GHz DSSS procedure using the exposure condition established by the initial test position.
 - b. SAR is measured for 2.4 GHz and 5 GHz OFDM configurations using the initial test configuration. 802.11b/g/n operating modes are tested independently according to the service requirements in each frequency band. 802.11b/g/n modes are tested on the maximum average output channel.
5. The Initial test position does not apply to devices that require a fixed exposure test position. SAR is measured in a fixed exposure test position for these devices in 802.11b according to the 2.4 GHz DSSS procedure or in 2.4 GHz and 5 GHz OFDM configurations using the initial test configuration procedures.
6. The "subsequent test configuration" procedures are applied to determine if additional SAR measurements are required for the remaining OFDM transmission modes that have not been tested in the initial test configuration. SAR test exclusion is determined according to reported SAR in the initial test configuration and maximum output power specified or measured for these other OFDM configurations.

SAR Procedures

Separate SAR procedures are applied to DSSS and OFDM configurations in the 2.4 GHz band to simplify DSSS test requirements. For 802.11b DSSS SAR measurements, DSSS SAR procedure applies to fixed exposure test position and initial test position procedure applies to multiple exposure test positions. When SAR measurement is required for an OFDM configuration, the initial test configuration, subsequent test configuration and initial test position procedures are applied. The SAR test exclusion requirements for 802.11g/n OFDM configurations are described in section 5.2.2.

1. 802.11b DSSS SAR Test Requirements

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

- a. When the reported SAR of the highest measured maximum output power channel (section 3.1) for the exposure configuration is ≤ 0.8 W/kg, no further SAR testing is required for 802.11b DSSS in that exposure configuration.
- b. When the reported SAR is > 0.8 W/kg, SAR is required for that exposure configuration 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.

1. 2.4 GHz 802.11g/n OFDM SAR Test Exclusion Requirements
When SAR measurement is required for 2.4 GHz 802.11g/n OFDM configurations, the measurement and test reduction procedures for OFDM are applied (section 5.3). SAR is not required for the following 2.4 GHz OFDM conditions.
 - a. When KDB Publication 447498 SAR test exclusion applies to the OFDM configuration
 - b. When the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.
2. SAR Test Requirements for OFDM Configurations
When SAR measurement is required for 802.11 a/g/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 applies. 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.²⁰ 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.
3. OFDM Transmission Mode SAR Test Configuration and Channel Selection Requirements
The initial test configuration for 2.4 GHz and 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 (section 4). 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.
 - a. The largest channel bandwidth configuration is selected among the multiple configurations with the same specified maximum output power.
 - b. 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.
 - c. 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.
 - d. 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.
 - a. When there are multiple test channels with the same measured maximum output power, the channel closest to mid-band frequency is selected for SAR measurement.
 - b. When there are multiple test channels with the same measured maximum output power and 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.

Initial Test Configuration Procedures

An initial test configuration is determined for OFDM transmission modes according to the channel bandwidth, modulation and data rate combination(s) with the highest maximum output power specified for production units in each standalone and aggregated frequency band. SAR is measured using the highest measured maximum output power channel. For configurations with the same specified or measured maximum output power, additional transmission mode and test channel selection procedures are required (see section 5.3.2). SAR test reduction of subsequent highest output test channels is based on the reported SAR of the initial test configuration.

For next to the ear and UMC mini-tablet exposure configurations where multiple test positions are required, the initial test position procedure is applied to minimize the number of test positions required for SAR measurement using the initial test configuration transmission mode.²³ For fixed exposure conditions that do not have multiple SAR test positions, SAR is measured in the transmission mode determined by the initial test configuration. When the reported SAR of the initial test configuration is > 0.8 W/kg, SAR measurement is required for the subsequent next highest measured output power channel(s) in the initial test configuration until the reported SAR is ≤ 1.2 W/kg or all required channels are tested.

4. Subsequent Test Configuration Procedures

SAR measurement requirements for the remaining 802.11 transmission mode configurations that have not been tested in the initial test configuration are determined separately for each standalone and aggregated frequency band, in each exposure condition, according to the maximum output power specified for production

units. The initial test position procedure is applied to next to the ear, UMPC mini-tablet mode configurations. When the same maximum output power is specified for multiple transmission modes, the procedures in section 5.3.2 are applied to determine the test configuration. Additional power measurements may be required to determine if SAR measurements are required for subsequent highest output power channels in a subsequent test configuration. The subsequent test configuration and SAR measurement procedures are described in the following.

- a. When SAR test exclusion provisions of KDB Publication 447498 are applicable and SAR measurement is not required for the initial test configuration, SAR is also not required for the next highest maximum output power transmission mode subsequent test configuration(s) in that frequency band or aggregated band and exposure configuration.
- b. When the highest reported SAR for the initial test configuration (when applicable, include subsequent highest output channels), according to the initial test position or fixed exposure position requirements, is adjusted by the ratio of the subsequent test configuration to initial test configuration specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg, SAR is not required for that subsequent test configuration.
- C. The number of channels in the initial test configuration and subsequent test configuration can be different due to differences in channel bandwidth. When SAR measurement is required for a subsequent test configuration and the channel bandwidth is smaller than that in the initial test configuration, all channels in the subsequent test configuration that overlap with the larger bandwidth channel tested in the initial test configuration should be used to determine the highest maximum output power channel. This step requires additional power measurement to identify the highest maximum output power channel in the subsequent test configuration to determine SAR test reduction.
 - 1). SAR should first be measured for the channel with highest measured output power in the subsequent test configuration.
 - 2). SAR for subsequent highest measured maximum output power channels in the subsequent test configuration is required only when the reported SAR of the preceding higher maximum output power channel(s) in the subsequent test configuration is > 1.2 W/kg or until all required channels are tested.
 - a) For channels with the same measured maximum output power, SAR should be measured using the channel closest to the center frequency of the larger channel bandwidth channel in the initial test configuration.
- D. SAR measurements for the remaining highest specified maximum output power OFDM transmission mode configurations that have not been tested in the initial test configuration (highest maximum output) or subsequent test configuration(s) (subsequent next highest maximum output power) is determined by applying the subsequent test configuration procedures in this section to the remaining configurations according to the following:
 - 1) replace "subsequent test configuration" with "next subsequent test configuration" (i.e., subsequent next highest specified maximum output power configuration)
 - 2) replace "initial test configuration" with "all tested higher output power configurations."

4.14. Power Drift

To control the output power stability during the SAR test, DASY5 system calculates the power drift by measuring the E-field at the same location at the beginning and at the end of the measurement for each test position. These drift values can be found in Table 14.1 to Table 14.11 labeled as: (Power Drift [dB]). This ensures that the power drift during one measurement is within 5%.

4.15. Power Reduction

The product without any power reduction.

5. TEST CONDITIONS AND RESULTS

5.1. Conducted Power Results

According KDB 447498 D01 General RF Exposure Guidance v06 Section 4.1 2) states that “Unless it is specified differently in the published RF exposure KDB procedures, these requirements also apply to test reduction and test exclusion considerations. Time-averaged maximum conducted output power applies to SAR and, as required by § 2.1091(c), time-averaged ERP applies to MPE. When an antenna port is not available on the device to support conducted power measurement, such as FRS and certain Part 15 transmitters with built-in integral antennas, the maximum output power allowed for production units should be used to determine RF exposure test exclusion and compliance.”

<GSM Conducted Power>

General Note:

1. Per KDB 447498 D01v06, the maximum output power channel is used for SAR testing and for further SAR test reduction.
2. According to October 2013TCB Workshop, for GSM / GPRS / EGPRS, the number of time slots to test for SAR should correspond to the highest frame-average maximum output power configuration, considering the possibility of e.g. 3rd party VoIP operation for head and body-worn SAR testing, the EUT was set in GPRS (3Tx slot) for GSM850/GSM1900 band due to their highest frame-average power.
3. For hotspot mode SAR testing, GPRS / EDGE should be evaluated, therefore the EUT was set in GPRS (3 Tx slots) for GSM850/GSM1900 band due to its highest frame-average power.

Conducted Power Measurement Results (GSM900/1800) <SIM1>

GSM 850		Burst Conducted power (dBm)			/	Average power (dBm)		
		Channel/Frequency(MHz)				Channel/Frequency(MHz)		
		128/824.2	190/836.6	251/848.8		128/824.2	190/836.6	251/848.8
GSM (Voice)		32.55	32.81	32.48	-9.03dB	23.52	23.78	23.45
GPRS (GMSK)	1TX slot	32.51	32.77	32.48	-9.03dB	23.48	23.74	23.45
	2TX slot	30.63	30.84	30.52	-6.02dB	24.61	24.82	24.50
	3TX slot	28.26	28.46	28.23	-4.26dB	24.00	24.20	23.97
	4TX slot	27.79	27.92	27.70	-3.01dB	24.78	24.91	24.69
EGPRS (8-PSK)	1TX slot	26.66	26.54	26.33	-9.03dB	17.63	17.51	17.30
	2TX slot	25.59	25.71	25.62	-6.02dB	19.57	19.69	19.60
	3TX slot	24.34	24.47	24.44	-4.26dB	20.08	20.21	20.18
	4TX slot	23.13	23.34	23.29	-3.01dB	20.12	20.33	20.28
GSM 1900		Burst Conducted power (dBm)			/	Average power (dBm)		
		Channel/Frequency(MHz)				Channel/Frequency(MHz)		
		512/ 1850.2	661/ 1880	810/ 1909.8		512/ 1850.2	661/ 1880	810/ 1909.8
GSM (Voice)		30.22	30.41	30.48	-9.03dB	21.19	21.38	21.45
GPRS (GMSK)	1TX slot	30.16	30.37	30.33	-9.03dB	21.13	21.34	21.30
	2TX slot	28.37	28.52	28.28	-6.02dB	22.35	22.50	22.26
	3TX slot	26.48	26.52	26.36	-4.26dB	22.22	22.26	22.10
	4TX slot	25.72	25.96	25.69	-3.01dB	22.71	22.95	22.68
EGPRS (8-PSK)	1TX slot	25.41	25.52	25.37	-9.03dB	16.38	16.49	16.34
	2TX slot	24.16	24.28	24.21	-6.02dB	18.14	18.26	18.19
	3TX slot	23.50	23.44	23.33	-4.26dB	19.24	19.18	19.07
	4TX slot	22.29	22.36	22.15	-3.01dB	19.28	19.35	19.14

Conducted Power Measurement Results (GSM900/1800) <SIM2>

GSM 850		Burst Conducted power (dBm)			/	Average power (dBm)		
		Channel/Frequency(MHz)				Channel/Frequency(MHz)		
		128/824.2	190/836.6	251/848.8		128/824.2	190/836.6	251/848.8
GSM (Voice)		32.34	32.70	32.43	-9.03dB	23.31	23.67	23.40
GPRS (GMSK)	1TX slot	32.34	32.65	32.39	-9.03dB	23.31	23.62	23.36
	2TX slot	30.56	30.72	30.41	-6.02dB	24.54	24.70	24.39
	3TX slot	28.20	28.39	28.19	-4.26dB	23.94	24.13	23.93
	4TX slot	27.78	27.82	27.74	-3.01dB	24.77	24.81	24.73
EGPRS (8-PSK)	1TX slot	26.61	26.54	26.27	-9.03dB	17.58	17.51	17.24
	2TX slot	25.48	25.66	25.56	-6.02dB	19.46	19.64	19.54
	3TX slot	24.37	24.40	24.41	-4.26dB	20.11	20.14	20.15
	4TX slot	23.11	23.29	23.23	-3.01dB	20.10	20.28	20.22
GSM 1900		Burst Conducted power (dBm)			/	Average power (dBm)		
		Channel/Frequency(MHz)				Channel/Frequency(MHz)		
		512/ 1850.2	661/ 1880	810/ 1909.8		512/ 1850.2	661/ 1880	810/ 1909.8
GSM (Voice)		30.28	30.39	30.44	-9.03dB	21.25	21.36	21.41
GPRS (GMSK)	1TX slot	30.22	30.35	30.32	-9.03dB	21.19	21.32	21.29
	2TX slot	28.31	28.47	28.25	-6.02dB	22.29	22.45	22.23
	3TX slot	26.44	26.52	26.31	-4.26dB	22.18	22.26	22.05
	4TX slot	25.69	25.91	25.69	-3.01dB	22.68	22.90	22.68
EGPRS (8-PSK)	1TX slot	25.38	25.47	25.3	-9.03dB	16.35	16.44	16.27
	2TX slot	24.19	24.23	24.26	-6.02dB	18.17	18.21	18.24
	3TX slot	23.46	23.44	23.34	-4.26dB	19.20	19.18	19.08
	4TX slot	22.27	22.37	22.07	-3.01dB	19.26	19.36	19.06

Notes:**1) Division Factors**

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

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

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

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

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

2) This sample supports two SIM cards, SIM 1 support GSM/UMTS/LTE, SIM 2 only support GSM;

3) SAR measured at SIM 1 as conducted power higher than SIM 2;

<UMTS Conducted Power>

The following tests were conducted according to the test requirements outlines in 3GPP TS 34.121 specification. A summary of these settings are illustrated below:

HSDPA Setup Configuration:

- a. The EUT was connected to Base Station E5515C referred to the Setup Configuration.
- b. The RF path losses were compensated into the measurements.
- c. A call was established between EUT and Base Station with following setting:
 - i. Set Gain Factors (β_c and β_d) and parameters were set according to each
 - ii. Specific sub-test in the following table, C10.1.4, quoted from the TS 34.121
 - iii. Set RMC 12.2Kbps + HSDPA mode.
 - iv. Set Cell Power = -86 dBm
 - v. Set HS-DSCH Configuration Type to FRC (H-set 1, QPSK)
 - vi. Select HSDPA Uplink Parameters
 - vii. Set Delta ACK, Delta NACK and Delta CQI = 8
 - viii. Set Ack-Nack Repetition Factor to 3
 - ix. Set CQI Feedback Cycle (k) to 4 ms
 - x. Set CQI Repetition Factor to 2
 - xi. Power Ctrl Mode = All Up bits
- d. The transmitted maximum output power was recorded.

Table C.10.1.4: β values for transmitter characteristics tests with HS-DPCCH

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{hs} (Note 1, Note 2)	CM (dB) (Note 3)	MPR (dB) (Note 3)
1	2/15	15/15	64	2/15	4/15	0.0	0.0
2	12/15 (Note 4)	15/15 (Note 4)	64	12/15 (Note 4)	24/15	1.0	0.0
3	15/15	8/15	64	15/8	30/15	1.5	0.5
4	15/15	4/15	64	15/4	30/15	1.5	0.5

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

Note 2: For the HS-DPCCH power mask requirement test in clause 5.2C, 5.7A, and the Error Vector Magnitude (EVM) with HS-DPCCH test in clause 5.13.1A, and HSDPA EVM with phase discontinuity in clause 5.13.1AA, Δ_{ACK} and $\Delta_{NACK} = 30/15$ with $\beta_{hs} = 30/15 * \beta_c$, and $\Delta_{CQI} = 24/15$ with $\beta_{hs} = 24/15 * \beta_c$.

Note 3: CM = 1 for $\beta_c/\beta_d = 12/15$, $\beta_{hs}/\beta_c = 24/15$. For all other combinations of DPDCH, DPCCH and HS-DPCCH the MPR is based on the relative CM difference. This is applicable for only UEs that support HSDPA in release 6 and later releases.

Note 4: 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 signalled gain factors for the reference TFC (TF1, TF1) to $\beta_c = 11/15$ and $\beta_d = 15/15$.

Setup Configuration

HSUPA Setup Configuration:

- a. The EUT was connected to Base Station R&S CMU200 referred to the Setup Configuration.
- b. The RF path losses were compensated into the measurements.
- c. A call was established between EUT and Base Station with following setting * :
 - i. Call Configs = 5.2B, 5.9B, 5.10B, and 5.13.2B with QPSK
 - ii. Set the Gain Factors (β_c and β_d) and parameters (AG Index) were set according to each specific sub-test in the following table, C11.1.3, quoted from the TS 34.121
 - iii. Set Cell Power = -86 dBm
 - iv. Set Channel Type = 12.2k + HSPA
 - v. Set UE Target Power
 - vi. Power Ctrl Mode= Alternating bits
 - vii. Set and observe the E-TFCI
 - viii. Confirm that E-TFCI is equal to the target E-TFCI of 75 for sub-test 1, and other subtest's E-TFCI
- d. The transmitted maximum output power was recorded.

Table C.11.1.3: β values for transmitter characteristics tests with HS-DPCCH and E-DCH

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{HS} (Note 1)	β_{ec}	β_{ed} (Note 5) (Note 6)	β_{ed} (SF)	β_{ed} (Codes)	CM (dB) (Note 2)	MPR (dB) (Note 2)	AG Index (Note 6)	E- TFCI
1	11/15 (Note 3)	15/15 (Note 3)	64	11/15 (Note 3)	22/15	209/2 25	1309/225	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 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 (Note 4)	15/15 (Note 4)	64	15/15 (Note 4)	30/15	24/15	134/15	4	1	1.0	0.0	21	81

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

Note 2: CM = 1 for $\beta_c/\beta_d=12/15$, $\beta_{HS}/\beta_c=24/15$. 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 signalled gain factors for the reference TFC (TF1, TF1) to $\beta_c = 10/15$ and $\beta_d = 15/15$.

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 signalled gain factors for the reference TFC (TF1, TF1) to $\beta_c = 14/15$ and $\beta_d = 15/15$.

Note 5: In case of testing by UE using E-DPDCH Physical Layer category 1, Sub-test 3 is omitted according to TS25.306 Table 5.1g.

Note 6: β_{ed1} can not be set directly, it is set by Absolute Grant Value.

General Note

1. Per KDB 941225 D01, RMC 12.2kbps setting is used to evaluate SAR. If AMR 12.2kbps power is < 0.25dB higher than RMC 12.2kbps, SAR tests with AMR 12.2kbps can be excluded.
2. By design, AMR and HSDPA/HSUPA RF power will not be larger than RMC 12.2kbps, detailed information is included in Tune-up Procure exhibit.
3. It is expected by the manufacturer that MPR for some HSDPA/HSUPA subtests may differ from the specification of 3GPP, according to the chipset implementation in this model. The implementation and expected deviation are detailed in tune-up procedure exhibit.

Conducted Power Measurement Results (WCDMA Band V/IV)

Item	band	WCDMA Band IV result (dBm)			WCDMA Band V result (dBm)		
		Channel/Frequency(MHz)			Channel/Frequency(MHz)		
	Sub-test	1312/1712.4	1413/1732.6	1513/1752.6	4132/826.4	4183/836.6	4233/846.6
RMC	12.2kbps	23.40	23.50	23.57	23.43	23.37	23.45
	64kbps	23.34	23.41	23.44	23.34	23.29	23.35
	144kbps	23.29	23.33	23.38	23.28	23.18	23.26
	384kbps	23.21	23.22	23.27	23.16	23.11	23.19
HSDPA	Sub –Test 1	22.86	22.83	22.94	22.77	22.78	22.81
	Sub –Test 2	22.36	22.38	33.22	22.41	22.49	22.32
	Sub –Test 3	21.80	21.78	21.87	21.86	21.82	21.87
	Sub –Test 4	21.74	21.77	21.87	21.81	21.88	21.89
HSUPA	Sub –Test 1	21.84	21.76	21.84	21.82	21.80	21.86
	Sub –Test 2	21.82	21.77	21.78	21.71	21.76	21.74
	Sub –Test 3	21.77	21.76	21.84	21.76	21.85	21.84
	Sub –Test 4	21.73	21.75	21.83	21.73	21.74	21.86
	Sub –Test 5	21.83	21.78	21.72	21.74	21.73	21.79

Note:

- 1) When the maximum output power and tune-up tolerance specified for production units in a secondary mode is $\leq 1/2$ dB higher than the primary mode (RMC12.2kbps) or when the highest reported SAR of the primary mode is scaled by the ratio of specified maximum output power and tune-up tolerance of secondary to primary mode and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for the secondary mode.
- 2) This sample supports two SIM cards, SIM 1 support GSM/UMTS/LTE, SIM 2 only support GSM;

<LTE Conducted Power>

General Note:

1. Per KDB 447498 D01v06, the maximum output power channel is used for SAR testing and for further SAR test reduction.
2. LTE SAR measurement at difference channel bandwidth, RB offset;
3. This sample supports two SIM cards, SIM 1 support GSM/UMTS/LTE, SIM 2 only support GSM;

LTE FDD Band 2

TX Channel Bandwidth	Frequency (MHz)	RB Configuration		Average Power [dBm]	
		Size	Offset	QPSK	16QAM
1.4 MHz	1850.7	1	0	22.61	21.69
		1	3	22.42	21.19
		1	5	22.33	21.50
		3	0	21.68	20.17
		3	2	21.43	20.80
		3	3	21.38	20.55
		6	0	21.09	20.29
	1880.0	1	0	22.10	21.71
		1	3	21.95	21.21
		1	5	22.36	21.24
		3	0	21.18	20.63
		3	2	21.57	20.93
		3	3	21.68	20.21
		6	0	21.49	20.73
	1909.3	1	0	22.24	21.99
		1	3	22.15	21.54

		1	5	22.15	21.77
		3	0	21.48	20.72
		3	2	21.73	20.93
		3	3	21.20	20.74
		6	0	21.55	20.34
3 MHz	1851.5	1	0	22.28	21.73
		1	7	22.11	21.68
		1	14	22.59	21.88
		8	0	21.91	20.68
		8	7	21.37	20.55
		8	14	21.28	20.60
		15	0	21.00	20.31
	1880.0	1	0	22.58	21.68
		1	7	22.35	21.62
		1	14	22.27	21.82
		8	0	21.92	20.87
		8	7	21.33	20.22
		8	14	21.49	20.13
		15	0	21.50	20.40
	1908.5	1	0	22.45	21.78
		1	7	22.05	21.93
		1	14	22.03	21.68
		8	0	21.60	20.25
		8	7	21.40	20.64
		8	14	21.19	20.15
		15	0	21.46	20.50
5 MHz	1852.5	1	0	22.27	21.16
		1	12	22.65	21.12
		1	24	22.47	21.24
		12	0	21.51	20.54
		12	6	21.50	20.99
		12	13	21.94	20.82
		25	0	21.50	20.55
	1880.0	1	0	22.39	21.29
		1	12	22.31	21.18
		1	24	22.65	21.18
		12	0	21.54	20.21
		12	6	21.11	20.51
		12	13	21.25	20.62
		25	0	21.42	20.47
	1907.5	1	0	22.28	21.53
		1	12	22.01	21.92
		1	24	22.45	21.67
		12	0	21.40	20.63
		12	6	21.52	20.23
		12	13	21.28	20.13
		25	0	21.51	20.15
10 MHz	1855.0	1	0	22.31	21.84
		1	24	22.45	21.93
		1	49	22.26	21.61
		25	0	21.43	20.83
		25	12	21.56	20.62
		25	25	21.62	20.61
		50	0	21.40	20.57
	1880.0	1	0	22.19	21.82
		1	24	22.18	21.87
		1	49	22.19	21.02
		25	0	21.94	20.75
		25	12	21.40	20.20
		25	25	21.95	20.83
		50	0	21.40	20.66
	1905.0	1	0	22.51	21.09

		1	24	21.92	21.68
		1	49	22.21	21.97
		25	0	21.03	20.74
		25	12	21.54	20.92
		25	25	21.28	20.56
		50	0	21.20	20.20
15 MHz	1857.5	1	0	21.90	21.27
		1	37	22.13	21.82
		1	74	22.38	21.28
		37	0	21.93	20.79
		37	18	21.32	20.60
		37	38	21.05	20.83
		75	0	21.13	20.07
	1880.0	1	0	22.54	21.77
		1	37	22.63	21.97
		1	74	22.68	21.68
		37	0	21.28	20.88
		37	18	21.58	20.16
		37	38	21.25	20.84
		75	0	21.42	20.04
	1902.5	1	0	22.06	21.02
		1	37	22.65	21.22
		1	74	21.92	21.61
		37	0	21.44	20.22
		37	18	21.23	20.55
		37	38	21.10	20.64
		75	0	21.17	20.37
20 MHz	1860.0	1	0	22.78	21.57
		1	49	22.89	21.43
		1	99	22.80	21.10
		50	0	21.65	20.16
		50	25	21.90	20.60
		50	50	21.45	20.17
		100	0	21.20	20.24
	1880.0	1	0	22.61	21.97
		1	49	22.73	21.85
		1	99	22.71	20.45
		50	0	21.35	20.33
		50	25	21.82	20.37
		50	50	21.84	20.17
		100	0	21.63	20.11
	1900.0	1	0	22.37	21.51
		1	49	22.72	21.37
		1	99	22.85	21.27
		50	0	21.41	20.95
		50	25	21.75	20.82
		50	50	21.30	20.78
		100	0	21.70	20.54

LTE FDD Band 4

TX Channel Bandwidth	Frequency (MHz)	RB Configuration		Average Power [dBm]	
		Size	Offset	QPSK	16QAM
1.4 MHz	1710.07	1	0	22.72	21.43
		1	3	22.61	21.12
		1	5	22.64	21.48
		3	0	21.79	20.37
		3	2	21.67	20.66
		3	3	21.08	20.72
		6	0	21.34	20.68
	1732.5	1	0	22.71	21.53
		1	3	22.76	21.84
		1	5	22.93	21.69
		3	0	21.83	20.76
		3	2	21.92	20.94
		3	3	21.89	20.80
		6	0	21.67	20.78
	1754.3	1	0	22.78	21.37
		1	3	22.13	21.78
		1	5	22.75	21.45
		3	0	21.88	20.94
		3	2	21.88	20.64
		3	3	21.30	20.81
		6	0	21.08	20.36
3 MHz	1711.5	1	0	22.73	21.79
		1	7	22.84	21.70
		1	14	22.06	21.80
		8	0	21.85	20.24
		8	7	21.64	20.68
		8	14	21.88	20.31
		15	0	21.24	20.47
	1732.5	1	0	22.62	21.29
		1	7	22.78	21.69
		1	14	22.00	21.76
		8	0	21.82	20.65
		8	7	21.91	20.45
		8	14	21.27	20.62
		15	0	21.19	20.36
	1753.5	1	0	22.63	21.79
		1	7	22.91	21.39
		1	14	22.75	21.31
		8	0	21.82	20.86
		8	7	21.70	20.44
		8	14	21.72	20.48
		15	0	21.62	20.34
5 MHz	1712.0	1	0	22.98	21.99
		1	12	22.23	21.27
		1	24	22.35	21.29
		12	0	21.23	20.62
		12	6	21.71	20.61
		12	13	21.81	20.60
		25	0	21.24	20.58
	1732.5	1	0	22.30	21.71
		1	12	22.59	21.95
		1	24	22.36	21.87
		12	0	21.97	20.88
		12	6	21.61	20.91
		12	13	21.25	20.36
		25	0	21.80	20.37
	1752.5	1	0	22.86	21.47
		1	12	22.62	21.36
		1	24	22.35	21.69

		12	0	21.71	20.49
		12	6	21.30	20.46
		12	13	21.15	20.79
		25	0	21.50	20.24
10 MHz	1715.0	1	0	22.08	21.56
		1	24	22.64	21.63
		1	49	22.92	21.86
		25	0	21.32	20.22
		25	12	21.06	20.73
		25	25	21.83	20.60
		50	0	21.79	20.41
	1732.5	1	0	22.69	21.84
		1	24	22.18	21.29
		1	49	22.86	21.95
		25	0	21.86	20.21
		25	12	21.74	20.68
		25	25	21.23	20.34
		50	0	21.85	20.61
	1750.0	1	0	22.96	21.25
		1	24	22.10	21.23
		1	49	22.62	21.74
		25	0	21.25	20.47
		25	12	21.61	20.87
		25	25	21.80	20.57
		50	0	21.68	20.31
15 MHz	1717.5	1	0	22.50	21.29
		1	37	22.33	21.84
		1	74	22.36	21.86
		37	0	21.34	20.83
		37	18	21.27	20.84
		37	38	21.18	20.60
		75	0	21.16	20.55
	1732.5	1	0	22.13	21.70
		1	37	22.04	21.49
		1	74	22.42	21.57
		37	0	21.56	20.20
		37	18	21.91	20.79
		37	38	21.52	20.98
		75	0	21.48	20.55
	1747.5	1	0	22.82	21.41
		1	37	22.43	21.50
		1	74	22.08	21.79
		37	0	21.89	20.74
		37	18	21.60	20.81
		37	38	21.47	20.57
		75	0	21.53	20.64
20 MHz	1720.0	1	0	22.73	21.38
		1	49	22.16	21.67
		1	99	22.49	21.15
		50	0	21.65	20.94
		50	25	21.39	20.72
		50	50	21.20	20.90
		100	0	21.17	20.78
	1732.5	1	0	22.47	21.29
		1	49	22.53	21.01
		1	99	22.61	21.65
		50	0	21.83	20.93
		50	25	21.31	20.97
		50	50	21.74	20.84
		100	0	21.59	20.28
	1745.0	1	0	22.30	21.62
		1	49	22.61	21.29

		1	99	22.23	21.16
		50	0	21.70	20.62
		50	25	21.50	20.36
		50	50	21.73	20.44
		100	0	21.59	20.46

LTE Band12

BW (MHz)	Frequency (MHz)	RB Configuration		Average Power [dBm]	
		Size	Offset	QPSK	16QAM
1.4	699.7	1	0	22.34	21.52
		1	3	22.52	21.50
		1	5	22.27	21.16
		3	0	21.67	20.54
		3	2	21.87	20.48
		3	3	21.20	20.05
		6	0	21.55	20.05
	707.5	1	0	22.28	22.55
		1	3	22.56	22.18
		1	5	22.97	21.99
		3	0	21.36	20.82
		3	2	21.28	20.22
		3	3	21.90	20.64
		6	0	21.27	20.53
	715.3	1	0	22.57	21.43
		1	3	22.70	21.40
		1	5	22.27	21.51
		3	0	21.96	20.46
		3	2	21.87	20.83
		3	3	21.53	20.83
		6	0	21.48	20.63
3	700.5	1	0	22.57	21.51
		1	7	22.91	21.33
		1	14	22.47	21.15
		8	0	21.32	20.02
		8	4	21.93	20.87
		8	7	21.60	20.57
		15	0	21.89	20.68
	707.5	1	0	22.45	21.35
		1	7	22.79	21.51
		1	14	22.32	21.30
		8	0	21.26	20.36
		8	4	21.86	20.48
		8	7	21.73	20.36
		15	0	21.62	20.31
	715.3	1	0	22.50	21.20
		1	7	22.71	21.41
		1	14	22.61	21.52
		8	0	21.73	20.90
		8	4	21.95	20.51
		8	7	21.57	20.28
		15	0	21.45	20.39
5	701.5	1	0	22.38	21.60
		1	12	22.54	21.83
		1	24	22.57	21.15
		12	0	21.80	20.54
		12	6	21.66	20.04
		12	13	21.79	20.50
		25	0	21.51	20.02
	707.5	1	0	22.62	21.52
		1	12	22.96	21.16

		1	24	22.57	21.88		
		12	0	21.83	20.36		
		12	6	21.33	20.28		
		12	13	21.64	20.44		
		25	0	21.79	20.26		
	714.5	1	0	22.91	21.21		
		1	12	22.68	21.46		
		1	24	22.98	21.46		
		12	0	21.80	20.34		
		12	6	21.90	20.40		
		12	13	21.58	20.44		
		25	0	21.57	20.40		
		10	704.0	1	0	22.96	21.50
				1	24	22.85	21.86
1	49			22.62	21.75		
25	0			21.87	20.43		
25	12			21.89	20.13		
25	25			21.52	20.87		
50	0			21.59	20.55		
707.5	1		0	22.98	21.40		
	1		24	22.92	21.33		
	1		49	22.83	21.62		
	25	0	21.95	20.55			
	25	12	21.84	20.66			
	25	25	21.99	20.49			
	50	0	21.87	20.11			
713.5	1	0	22.96	21.21			
	1	24	22.56	21.77			
	1	49	22.50	21.81			
	25	0	21.98	20.62			
	25	12	21.62	20.49			
	25	25	21.88	20.77			
	50	0	21.72	20.68			

<WLAN 2.4GHz Conducted Power>

Mode	Channel	Frequency (MHz)	Data rate (Mbps)	Average Output Power (dBm)
IEEE 802.11b	1	2412	1	12.61
			2	12.55
			5.5	12.47
			11	12.42
	6	2437	1	12.74
			2	12.69
			5.5	12.55
			11	12.51
	11	2462	1	12.78
			2	12.70
			5.5	12.53
			11	12.49
IEEE 802.11g	1	2412	6	10.81
			9	10.77
			12	10.77
			18	10.75
			24	10.72
			36	10.71
			48	10.67
			54	10.66
	6	2437	6	11.08
			9	11.05
			12	11.04

			18	11.00
			24	10.97
			36	10.95
			48	10.95
			54	10.91
	11	2462	6	11.24
			9	11.20
			12	11.17
			18	11.12
			24	11.12
			36	11.09
			48	11.09
			54	11.06
IEEE 802.11n HT20	1	2412	MCS0	11.97
			MCS1	11.95
			MCS2	11.95
			MCS3	11.92
			MCS4	11.92
			MCS5	11.90
			MCS6	11.86
			MCS7	11.85
	6	2437	MCS0	11.92
			MCS1	11.91
			MCS2	11.87
			MCS3	11.86
			MCS4	11.83
			MCS5	11.82
			MCS6	11.77
			MCS7	11.76
	11	2462	MCS0	11.54
			MCS1	11.54
			MCS2	11.51
			MCS3	11.49
			MCS4	11.44
			MCS5	11.41
			MCS6	11.40
			MCS7	11.37
IEEE 802.11n HT40	3	2422	MCS0	11.04
			MCS1	11.04
			MCS2	11.02
			MCS3	11.01
			MCS4	10.97
			MCS5	10.96
			MCS6	10.92
			MCS7	10.92
	6	2437	MCS0	10.79
			MCS1	10.77
			MCS2	10.74
			MCS3	10.74
			MCS4	10.72
			MCS5	10.71
			MCS6	10.66
			MCS7	10.66
	9	2452	MCS0	10.51
			MCS1	10.50
			MCS2	10.47
			MCS3	10.47
			MCS4	10.46
			MCS5	10.42
			MCS6	10.42
			MCS7	10.41

Note: SAR is not required for the following 2.4 GHz OFDM conditions as the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.

<Bluetooth Conducted Power>

Mode	Channel	Frequency (MHz)	Conducted Average Power (dBm)
BLE-GFSK	0	2402	-7.12
	19	2440	-5.29
	39	2480	-5.45
GFSK	0	2402	-0.644
	39	2441	0.519
	78	2480	1.035
$\pi/4$ DQPSK	0	2402	-2.167
	39	2441	-1.594
	78	2480	-1.146
8DPSK	0	2402	-2.113
	39	2441	-1.591
	78	2480	-1.138

5.2. Manufacturing tolerance

GSM Speech <SIM1>

GSM 850 (GMSK) (Burst Average Power)			
Channel	128	190	251
Target (dBm)	32.0	32.0	32.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
GSM 1900 (GMSK) (Burst Average Power)			
Channel	512	661	810
Target (dBm)	30.0	30.0	30.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0

GSM 850 GPRS (GMSK) (Burst Average Power)				
Channel		128	190	251
1 Txslot	Target (dBm)	32.0	32.0	32.0
	Tolerance $\pm$ (dB)	1.0	1.0	1.0
2 Txslot	Target (dBm)	30.0	30.0	30.0
	Tolerance $\pm$ (dB)	1.0	1.0	1.0
3 Txslot	Target (dBm)	28.0	28.0	28.0
	Tolerance $\pm$ (dB)	1.0	1.0	1.0
4 Txslot	Target (dBm)	27.0	27.0	27.0
	Tolerance $\pm$ (dB)	1.0	1.0	1.0
GSM 850 EGPRS (8-PSK) (Burst Average Power)				
Channel		128	190	251
1 Txslot	Target (dBm)	26.0	26.0	26.0
	Tolerance $\pm$ (dB)	1.0	1.0	1.0
2 Txslot	Target (dBm)	25.0	25.0	25.0
	Tolerance $\pm$ (dB)	1.0	1.0	1.0
3 Txslot	Target (dBm)	24.0	24.0	24.0
	Tolerance $\pm$ (dB)	1.0	1.0	1.0
4 Txslot	Target (dBm)	23.0	23.0	23.0
	Tolerance $\pm$ (dB)	1.0	1.0	1.0
GSM 1900 GPRS (GMSK) (Burst Average Power)				
Channel		512	661	810
1 Txslot	Target (dBm)	30.0	30.0	30.0
	Tolerance $\pm$ (dB)	1.0	1.0	1.0
2 Txslot	Target (dBm)	28.0	28.0	28.0
	Tolerance $\pm$ (dB)	1.0	1.0	1.0
3 Txslot	Target (dBm)	26.0	26.0	26.0
	Tolerance $\pm$ (dB)	1.0	1.0	1.0
4 Txslot	Target (dBm)	25.0	25.0	25.0
	Tolerance $\pm$ (dB)	1.0	1.0	1.0

	Tolerance $\pm$ (dB)	1.0	1.0	1.0
GSM 1900 EGPRS (8-PSK) (Burst Average Power)				
Channel		512	661	810
1 Txslot	Target (dBm)	25.0	25.0	25.0
	Tolerance $\pm$ (dB)	1.0	1.0	1.0
2 Txslot	Target (dBm)	24.0	24.0	24.0
	Tolerance $\pm$ (dB)	1.0	1.0	1.0
3 Txslot	Target (dBm)	23.0	23.0	23.0
	Tolerance $\pm$ (dB)	1.0	1.0	1.0
4 Txslot	Target (dBm)	22.0	22.0	22.0
	Tolerance $\pm$ (dB)	1.0	1.0	1.0

GSM Speech <SIM2>

GSM 850 (GMSK) (Burst Average Power)				
Channel		128	190	251
Target (dBm)		32.0	32.0	32.0
Tolerance $\pm$ (dB)		1.0	1.0	1.0
GSM 1900 (GMSK) (Burst Average Power)				
Channel		512	661	810
Target (dBm)		30.0	30.0	30.0
Tolerance $\pm$ (dB)		1.0	1.0	1.0

GSM 850 GPRS (GMSK) (Burst Average Power)				
Channel		128	190	251
1 Txslot	Target (dBm)	32.0	32.0	32.0
	Tolerance $\pm$ (dB)	1.0	1.0	1.0
2 Txslot	Target (dBm)	30.0	30.0	30.0
	Tolerance $\pm$ (dB)	1.0	1.0	1.0
3 Txslot	Target (dBm)	28.0	28.0	28.0
	Tolerance $\pm$ (dB)	1.0	1.0	1.0
4 Txslot	Target (dBm)	27.0	27.0	27.0
	Tolerance $\pm$ (dB)	1.0	1.0	1.0
GSM 850 EGPRS (8-PSK) (Burst Average Power)				
Channel		128	190	251
1 Txslot	Target (dBm)	26.0	26.0	26.0
	Tolerance $\pm$ (dB)	1.0	1.0	1.0
2 Txslot	Target (dBm)	25.0	25.0	25.0
	Tolerance $\pm$ (dB)	1.0	1.0	1.0
3 Txslot	Target (dBm)	24.0	24.0	24.0
	Tolerance $\pm$ (dB)	1.0	1.0	1.0
4 Txslot	Target (dBm)	23.0	23.0	23.0
	Tolerance $\pm$ (dB)	1.0	1.0	1.0
GSM 1900 GPRS (GMSK) (Burst Average Power)				
Channel		512	661	810
1 Txslot	Target (dBm)	30.0	30.0	30.0
	Tolerance $\pm$ (dB)	1.0	1.0	1.0
2 Txslot	Target (dBm)	28.0	28.0	28.0
	Tolerance $\pm$ (dB)	1.0	1.0	1.0
3 Txslot	Target (dBm)	26.0	26.0	26.0
	Tolerance $\pm$ (dB)	1.0	1.0	1.0
4 Txslot	Target (dBm)	25.0	25.0	25.0
	Tolerance $\pm$ (dB)	1.0	1.0	1.0
GSM 1900 EGPRS (8-PSK) (Burst Average Power)				
Channel		512	661	810
1 Txslot	Target (dBm)	25.0	25.0	25.0
	Tolerance $\pm$ (dB)	1.0	1.0	1.0
2 Txslot	Target (dBm)	24.0	24.0	24.0
	Tolerance $\pm$ (dB)	1.0	1.0	1.0
3 Txslot	Target (dBm)	23.0	23.0	23.0
	Tolerance $\pm$ (dB)	1.0	1.0	1.0
4 Txslot	Target (dBm)	22.0	22.0	22.0
	Tolerance $\pm$ (dB)	1.0	1.0	1.0

UMTS (SIM1)

UMTS Band V (RMC)			
Channel	Channel 4132	Channel 4182	Channel 4233
Target (dBm)	23.0	23.0	23.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
UMTS Band V HSDPA(sub-test 1)			
Channel	Channel 4132	Channel 4182	Channel 4233
Target (dBm)	22.0	22.0	22.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
UMTS Band V HSDPA(sub-test 2)			
Channel	Channel 4132	Channel 4182	Channel 4233
Target (dBm)	22.0	22.0	22.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
UMTS Band V HSDPA(sub-test 3)			
Channel	Channel 4132	Channel 4182	Channel 4233
Target (dBm)	21.0	21.0	21.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
UMTS Band V HSDPA(sub-test 4)			
Channel	Channel 4132	Channel 4182	Channel 4233
Target (dBm)	21.0	21.0	21.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
UMTS Band V HSUPA(sub-test 1)			
Channel	Channel 4132	Channel 4182	Channel 4233
Target (dBm)	21.0	21.0	21.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
UMTS Band V HSUPA(sub-test 2)			
Channel	Channel 4132	Channel 4182	Channel 4233
Target (dBm)	21.0	21.0	21.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
UMTS Band V HSUPA(sub-test 3)			
Channel	Channel 4132	Channel 4182	Channel 4233
Target (dBm)	21.0	21.0	21.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
UMTS Band V HSUPA(sub-test 4)			
Channel	Channel 4132	Channel 4182	Channel 4233
Target (dBm)	21.0	21.0	21.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
UMTS Band V HSUPA(sub-test 5)			
Channel	Channel 4132	Channel 4182	Channel 4233
Target (dBm)	21.0	21.0	21.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0

UMTS Band IV (RMC)			
Channel	Channel 1312	Channel 1413	Channel 1513
Target (dBm)	23.0	23.0	23.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
UMTS Band IV HSDPA(sub-test 1)			
Channel	Channel 1312	Channel 1413	Channel 1513
Target (dBm)	22.0	22.0	22.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
UMTS Band IV HSDPA(sub-test 2)			
Channel	Channel 1312	Channel 1413	Channel 1513
Target (dBm)	21.0	21.0	21.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
UMTS Band IV HSDPA(sub-test 3)			
Channel	Channel 1312	Channel 1413	Channel 1513
Target (dBm)	22.0	22.0	22.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
UMTS Band IV HSDPA(sub-test 4)			
Channel	Channel 1312	Channel 1413	Channel 1513
Target (dBm)	21.0	21.0	21.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0

UMTS Band IV HSUPA(sub-test 1)			
Channel	Channel 1312	Channel 1413	Channel 1513
Target (dBm)	21.0	21.0	21.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
UMTS Band IV HSUPA(sub-test 2)			
Channel	Channel 1312	Channel 1413	Channel 1513
Target (dBm)	20.0	20.0	20.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
UMTS Band IV HSUPA(sub-test 3)			
Channel	Channel 1312	Channel 1413	Channel 1513
Target (dBm)	21.0	21.0	21.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
UMTS Band IV HSUPA(sub-test 4)			
Channel	Channel 1312	Channel 1413	Channel 1513
Target (dBm)	21.0	21.0	21.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
UMTS Band IV HSUPA(sub-test 5)			
Channel	Channel 1312	Channel 1413	Channel 1513
Target (dBm)	21.0	21.0	21.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0

LTE Band 2 <SIM1>

BW:1.4MHz [<RB=1>]						
Channel	Channel 18607		Channel 18900		Channel 19193	
	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM
Target (dBm)	22.0	21.0	22.0	21.0	22.0	21.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0	1.0	1.0	1.0
BW:1.4MHz [<RB=3>, <RB=6>]						
Channel	Channel 18607		Channel 18900		Channel 19193	
	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM
Target (dBm)	21.0	20.0	21.0	20.0	21.0	20.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0	1.0	1.0	1.0
BW:3MHz [<RB=1>]						
Channel	Channel 18615		Channel 18900		Channel 19185	
	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM
Target (dBm)	22.0	21.0	22.0	21.0	22.0	21.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0	1.0	1.0	1.0
BW:3MHz [<RB=8>, <RB=15>]						
Channel	Channel 18615		Channel 18900		Channel 19185	
	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM
Target (dBm)	21.0	20.0	21.0	20.0	21.0	20.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0	1.0	1.0	1.0
BW:5MHz [<RB=1>]						
Channel	Channel 18625		Channel 18900		Channel 19175	
	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM
Target (dBm)	22.0	21.0	22.0	21.0	22.0	21.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0	1.0	1.0	1.0
BW:5MHz [<RB=12>, <RB=25>]						
Channel	Channel 18625		Channel 18900		Channel 19175	
	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM
Target (dBm)	21.0	20.0	21.0	20.0	21.0	20.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0	1.0	1.0	1.0
BW:10MHz [<RB=1>]						
Channel	Channel 18650		Channel 18900		Channel 19150	
	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM
Target (dBm)	22.0	21.0	22.0	21.0	22.0	21.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0	1.0	1.0	1.0
BW:10MHz [<RB=25>, <RB=50>]						
Channel	Channel 18650		Channel 18900		Channel 19150	
	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM
Target (dBm)	21.0	20.0	21.0	20.0	21.0	20.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0	1.0	1.0	1.0

BW:15MHz [<RB=1>]						
Channel	Channel 18675		Channel 18900		Channel 19125	
	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM
Target (dBm)	22.0	21.0	22.0	21.0	22.0	21.0
Tolerance ±(dB)	1.0	1.0	1.0	1.0	1.0	1.0
BW:15MHz [<RB=37>, <RB=75>]						
Channel	Channel 18675		Channel 18900		Channel 19125	
	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM
Target (dBm)	21.0	20.0	21.0	20.0	21.0	20.0
Tolerance ±(dB)	1.0	1.0	1.0	1.0	1.0	1.0
BW:20MHz [<RB=1>]						
Channel	Channel 18700		Channel 18900		Channel 19100	
	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM
Target (dBm)	22.0	21.0	22.0	21.0	22.0	21.0
Tolerance ±(dB)	1.0	1.0	1.0	1.0	1.0	1.0
BW:20MHz [<RB=50>, <RB=100>]						
Channel	Channel 18700		Channel 18900		Channel 19100	
	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM
Target (dBm)	21.0	20.0	21.0	20.0	21.0	20.0
Tolerance ±(dB)	1.0	1.0	1.0	1.0	1.0	1.0

LTE Band 4 <SIM1>

BW:1.4MHz [<RB=1>]						
Channel	Channel 19957		Channel 20175		Channel 20393	
	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM
Target (dBm)	22.0	21.0	22.0	21.0	22.0	21.0
Tolerance ±(dB)	1.0	1.0	1.0	1.0	1.0	1.0
BW:1.4MHz [<RB=3>, <RB=6>]						
Channel	Channel 19957		Channel 20175		Channel 20393	
	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM
Target (dBm)	21.0	20.0	21.0	20.0	21.0	20.0
Tolerance ±(dB)	1.0	1.0	1.0	1.0	1.0	1.0
BW:3MHz [<RB=1>]						
Channel	Channel 19965		Channel 20175		Channel 20385	
	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM
Target (dBm)	22.0	21.0	22.0	21.0	22.0	21.0
Tolerance ±(dB)	1.0	1.0	1.0	1.0	1.0	1.0
BW:3MHz [<RB=8>, <RB=15>]						
Channel	Channel 19965		Channel 20175		Channel 20385	
	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM
Target (dBm)	21.0	20.0	21.0	20.0	21.0	20.0
Tolerance ±(dB)	1.0	1.0	1.0	1.0	1.0	1.0
BW:5MHz [<RB=1>]						
Channel	Channel 19975		Channel 20175		Channel 20375	
	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM
Target (dBm)	22.0	21.0	22.0	21.0	22.0	21.0
Tolerance ±(dB)	1.0	1.0	1.0	1.0	1.0	1.0
BW:5MHz [<RB=12>, <RB=25>]						
Channel	Channel 19975		Channel 20175		Channel 20375	
	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM
Target (dBm)	21.0	20.0	21.0	20.0	21.0	20.0
Tolerance ±(dB)	1.0	1.0	1.0	1.0	1.0	1.0
BW:10MHz [<RB=1>]						
Channel	Channel 20000		Channel 20175		Channel 20350	
	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM
Target (dBm)	22.0	21.0	22.0	21.0	22.0	21.0
Tolerance ±(dB)	1.0	1.0	1.0	1.0	1.0	1.0
BW:10MHz [<RB=25>, <RB=50>]						
Channel	Channel 20000		Channel 20175		Channel 20350	
	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM
Target (dBm)	21.0	20.0	21.0	20.0	21.0	20.0
Tolerance ±(dB)	1.0	1.0	1.0	1.0	1.0	1.0

BW:15MHz [<RB=1>]						
Channel	Channel 20025		Channel 20175		Channel 20325	
	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM
Target (dBm)	22.0	21.0	22.0	21.0	22.0	21.0
Tolerance ±(dB)	1.0	1.0	1.0	1.0	1.0	1.0
BW:15MHz [<RB=37>, <RB=75>]						
Channel	Channel 20025		Channel 20175		Channel 20325	
	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM
Target (dBm)	21.0	20.0	21.0	20.0	21.0	20.0
Tolerance ±(dB)	1.0	1.0	1.0	1.0	1.0	1.0
BW:20MHz [<RB=1>]						
Channel	Channel 20050		Channel 20175		Channel 20300	
	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM
Target (dBm)	22.0	21.0	22.0	21.0	22.0	21.0
Tolerance ±(dB)	1.0	1.0	1.0	1.0	1.0	1.0
BW:20MHz [<RB=50>, <RB=100>]						
Channel	Channel 20050		Channel 20175		Channel 20300	
	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM
Target (dBm)	21.0	20.0	21.0	20.0	21.0	20.0
Tolerance ±(dB)	1.0	1.0	1.0	1.0	1.0	1.0

LTE Band 12 <SIM1>

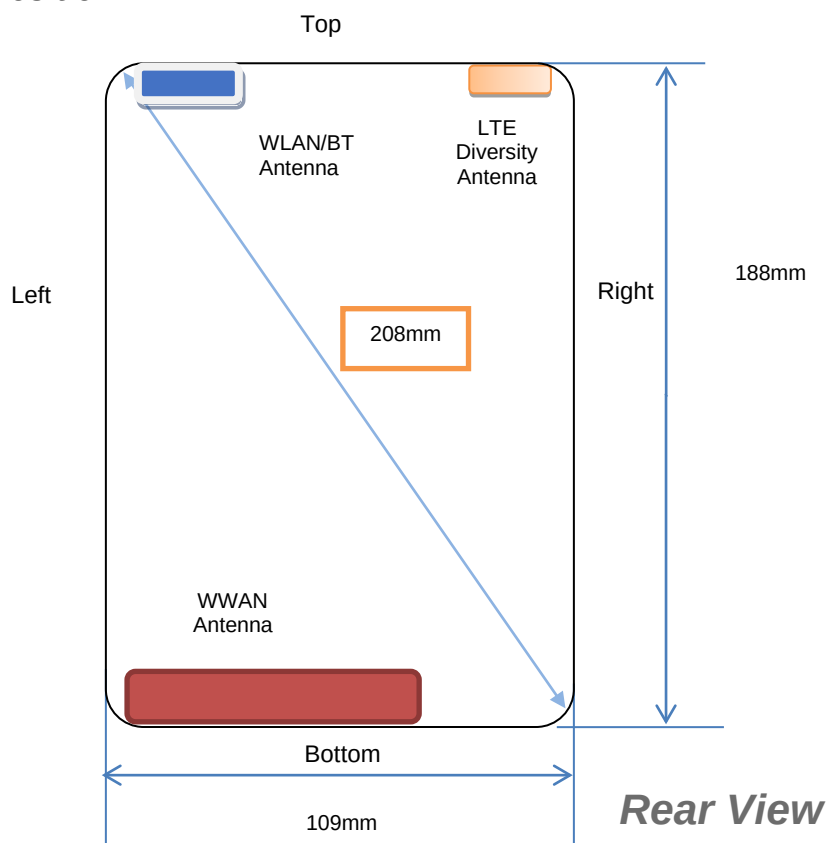
BW:1.4MHz [<RB=1>]						
Channel	Channel 23017		Channel 23095		Channel 23173	
	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM
Target (dBm)	22.0	21.0	22.0	21.0	22.0	21.0
Tolerance ±(dB)	1.0	1.0	1.0	1.0	1.0	1.0
BW:1.4MHz [<RB=3>, <RB=6>]						
Channel	Channel 23017		Channel 23095		Channel 23173	
	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM
Target (dBm)	21.0	20.0	21.0	20.0	21.0	20.0
Tolerance ±(dB)	1.0	1.0	1.0	1.0	1.0	1.0
BW:3MHz [<RB=1>]						
Channel	Channel 23025		Channel 23095		Channel 23165	
	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM
Target (dBm)	22.0	21.0	22.0	21.0	22.0	21.0
Tolerance ±(dB)	1.0	1.0	1.0	1.0	1.0	1.0
BW:3MHz [<RB=8>, <RB=15>]						
Channel	Channel 23025		Channel 23095		Channel 23165	
	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM
Target (dBm)	21.0	20.0	21.0	20.0	21.0	20.0
Tolerance ±(dB)	1.0	1.0	1.0	1.0	1.0	1.0
BW:5MHz [<RB=1>]						
Channel	Channel 23035		Channel 23095		Channel 23155	
	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM
Target (dBm)	22.0	21.0	22.0	21.0	22.0	21.0
Tolerance ±(dB)	1.0	1.0	1.0	1.0	1.0	1.0
BW:5MHz [<RB=12>, <RB=25>]						
Channel	Channel 23035		Channel 23095		Channel 23155	
	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM
Target (dBm)	21.0	20.0	21.0	20.0	21.0	20.0
Tolerance ±(dB)	1.0	1.0	1.0	1.0	1.0	1.0
BW:10MHz [<RB=1>]						
Channel	Channel 23060		Channel 23095		Channel 23130	
	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM
Target (dBm)	22.0	21.0	22.0	21.0	22.0	21.0
Tolerance ±(dB)	1.0	1.0	1.0	1.0	1.0	1.0
BW:10MHz [<RB=25>, <RB=50>]						
Channel	Channel 23060		Channel 23095		Channel 23130	
	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM
Target (dBm)	21.0	20.0	21.0	20.0	21.0	20.0
Tolerance ±(dB)	1.0	1.0	1.0	1.0	1.0	1.0

2.4GHzWLAN

IEEE 802.11b (Average)			
Frequency (MHz)	2412	2437	2462
Target (dBm)	12.0	12.0	12.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11g (Average)			
Frequency (MHz)	2412	2437	2462
Target (dBm)	11.0	11.0	11.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11n HT20 (Average)			
Frequency (MHz)	2412	2437	2462
Target (dBm)	11.0	11.0	11.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11n HT40 (Average)			
Frequency (MHz)	2422	2437	2452
Target (dBm)	11.0	11.0	11.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0

Bluetooth

GFSK (Average)			
Frequency (MHz)	2402	2440	2480
Target (dBm)	-7.0	-5.0	-5.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
GFSK - LE (Average)			
Frequency (MHz)	2402	2441	2480
Target (dBm)	-1.0	0	1.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
$\pi/4$DQPSK (Average)			
Frequency (MHz)	2402	2441	2480
Target (dBm)	-2.0	-1.0	-1.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
8DPSK (Average)			
Frequency (MHz)	2402	2441	2480
Target (dBm)	-2.0	-1.0	-1.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0

5.3. Transmit Antennas Position

Antenna information:

WWAN	GSM/UMTS/LTE TX/RX Antenna
WLAN/GPS/BT	WLAN/BT TX/RX Antenna
LTE Diversity Antenna	LTE RX Antenna

Distance of The Antenna to the EUT surface and edge						
Antennas	Front	Rear	Top	Bottom	Left	Right
BT/WLAN	<5mm	<5mm	<5mm	175mm	85mm	<5mm
WWAN	<5mm	<5mm	167mm	<5mm	<5mm	42mm

5.4. Standalone SAR Test Exclusion Considerations

Per KDB447498 for standalone 1-g head or body SAR evaluation by measurement or numerical simulation is not required when the corresponding SAR Exclusion Threshold condition, listed below, is satisfied.

a) 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:

$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}] \leq 3.0$ for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where

- $f(\text{GHz})$ 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
- 3.0 and 7.5 are referred to as the numeric thresholds in the step 2 below

b) For 100 MHz to 6 GHz and test separation distances > 50 mm, the 1-g and 10-g SAR test exclusion thresholds are determined by the following (also illustrated in Appendix B):

- 1) $\{[\text{Power allowed at numeric threshold for 50 mm in step a)}] + [(\text{test separation distance} - 50 \text{ mm}) \cdot (f(\text{MHz})/150)]\}$ mW, for 100 MHz to 1500 MHz
- 2) $\{[\text{Power allowed at numeric threshold for 50 mm in step a)}] + [(\text{test separation distance} - 50 \text{ mm}) \cdot 10]\}$ mW, for > 1500 MHz and ≤ 6 GHz

Standalone SAR test exclusion considerations							
Modulation	Frequency (MHz)	Configuration	Maximum Average Power (dBm)	Separation Distance (mm)	Calculation Result	SAR Exclusion Thresholds	Standalone SAR Exclusion
GSM	850	Head	24.99	5	58.2	3.0	no
		Test Position 1	24.99	5	58.2	3.0	no
		Test Position 2	24.99	5	58.2	3.0	no
		Test Position 3	24.99	42	6.9	3.0	no
		Test Position 4	24.99	167	24.99 dBm	29.17 dBm	yes
		Test Position 5	24.99	5	58.2	3.0	no
GSM	1900	Head	22.99	5	54.9	3.0	no
		Test Position 1	22.99	5	54.9	3.0	no
		Test Position 2	22.99	5	54.9	3.0	no
		Test Position 3	22.99	42	6.5	3.0	no
		Test Position 4	22.99	167	22.99 dBm	31.07 dBm	yes
		Test Position 5	22.99	5	54.9	3.0	no
UMTS	850	Head	24.00	5	46.3	3.0	no
		Test Position 1	24.00	5	46.3	3.0	no
		Test Position 2	24.00	5	46.3	3.0	no
		Test Position 3	24.00	42	5.5	3.0	no
		Test Position 4	24.00	167	24.00 dBm	29.17 dBm	yes
		Test Position 5	24.00	5	46.3	3.0	no
UMTS	1750	Head	24.00	5	66.5	3.0	no
		Test Position 1	24.00	5	66.5	3.0	no
		Test Position 2	24.00	5	66.5	3.0	no
		Test Position 3	24.00	42	7.9	3.0	no
		Test Position 4	24.00	167	24.00 dBm	31.08 dBm	yes
		Test Position 5	24.00	5	66.5	3.0	no
LTE Band 2	1900	Head	23.00	5	55.0	3.0	no
		Test Position 1	23.00	5	55.0	3.0	no
		Test Position 2	23.00	5	55.0	3.0	no
		Test Position 3	23.00	42	6.5	3.0	no

		Test Position 4	23.00	167	23.00 dBm	31.07 dBm	yes
		Test Position 5	23.00	5	55.0	3.0	no
LTE Band 4	1750 MHz	Head	23.00	5	52.8	3.0	no
		Test Position 1	23.00	5	52.8	3.0	no
		Test Position 2	23.00	5	52.8	3.0	no
		Test Position 3	23.00	42	6.3	3.0	no
		Test Position 4	23.00	167	23.00 dBm	31.08 dBm	yes
		Test Position 5	23.00	5	52.8	3.0	no
LTE Band 12	750 MHz	Head	23.00	5	34.6	3.0	no
		Test Position 1	23.00	5	34.6	3.0	no
		Test Position 2	23.00	5	34.6	3.0	no
		Test Position 3	23.00	42	4.1	3.0	no
		Test Position 4	23.00	167	23.00 dBm	28.80 dBm	yes
		Test Position 5	23.00	5	34.6	3.0	no
IEEE 802.11b	2450	Head	13.00	5	6.2	3.0	no
		Test Position 1	13.00	5	6.2	3.0	no
		Test Position 2	13.00	85	13.00 dBm	26.49 dBm	yes
		Test Position 3	13.00	5	6.2	3.0	no
		Test Position 4	13.00	5	6.2	3.0	no
		Test Position 5	13.00	175	13.00 dBm	31.29 dBm	yes
IEEE 802.11g	2450	Head	12.00	5	5.0	3.0	no
		Test Position 1	12.00	5	5.0	3.0	no
		Test Position 2	12.00	85	12.00 dBm	26.49 dBm	yes
		Test Position 3	12.00	5	5.0	3.0	no
		Test Position 4	12.00	5	5.0	3.0	no
		Test Position 5	12.00	175	12.00 dBm	31.29 dBm	yes
IEEE 802.11n HT20	2450	Head	12.00	5	5.0	3.0	no
		Test Position 1	12.00	5	5.0	3.0	no
		Test Position 2	12.00	85	12.00 dBm	26.49 dBm	yes
		Test Position 3	12.00	5	5.0	3.0	no
		Test Position 4	12.00	5	5.0	3.0	no
		Test Position 5	12.00	175	12.00 dBm	31.29 dBm	yes
IEEE 802.11n HT40	2450	Head	12.00	5	5.0	3.0	no
		Test Position 1	12.00	5	5.0	3.0	no
		Test Position 2	12.00	85	12.00 dBm	26.49 dBm	yes
		Test Position 3	12.00	5	5.0	3.0	no
		Test Position 4	12.00	5	5.0	3.0	no
		Test Position 5	12.00	175	12.00 dBm	31.29 dBm	yes
Bluetooth*	2450	Head	2.00	5	0.5	3.0	yes
		Test Position 1	2.00	5	0.5	3.0	yes
		Test Position 2	2.00	85	2.00 dBm	26.49 dBm	yes
		Test Position 3	2.00	5	0.5	3.0	yes
		Test Position 4	2.00	5	0.5	3.0	yes
		Test Position 5	2.00	175	2.00 dBm	31.29 dBm	yes

Remark:

1. Maximum average power including tune-up tolerance;
2. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion
3. Per KDB 648474, if overall diagonal dimension of the display section of a tablet larger than 20 cm, no need consider Hotspot mode.
4. Body as body use distance is 0mm from manufacturer declaration of user manual.

5.5. Standalone Estimated SAR

Per KDB447498 requires when the standalone SAR test exclusion of section 4.3.1 is applied to an antenna that transmits simultaneously with other antennas, the standalone SAR must be estimated according to the following to determine simultaneous transmission SAR test exclusion;

- $(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm}) \cdot [\sqrt{f(\text{GHz})/x}] \text{ W/kg}$ for test separation distances $\leq 50 \text{ mm}$;
Where $x = 7.5$ for 1-g SAR, and $x = 18.75$ for 10-g SAR.
- 0.4 W/kg for 1-g SAR and 1.0 W/kg for 10-g SAR, when the test separation distances is $> 50 \text{ mm}$

Per FCC KD B447498 D01, simultaneous transmission SAR test exclusion may be applied when the sum of the 1-g SAR for the entire transmitting antenna in a specific a physical test configuration is ≤ 1.6 W/Kg. When the sum is greater than the SAR limit, AR test exclusion is determined by the SAR to peak location separation ratio.

$$\text{Ratio} = \frac{(\text{SAR}_1 + \text{SAR}_2)^{1.5}}{(\text{peak location separation, mm})} < 0.04$$

Estimated Standalone SAR

Estimated stand alone SAR					
Communication system	Frequency (MHz)	Configuration	Maximum Power (dBm)	Separation Distance (mm)	Estimated SAR _{1-g} (W/kg)
Bluetooth*	2450	Head	2.00	5.00	0.066
		Test Position 1	2.00	5.00	0.066
		Test Position 3	2.00	5.00	0.066
		Test Position 4	2.00	5.00	0.066

Remark:

1. Maximum average power including tune-up tolerance;
2. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion;

5.6. SAR Measurement Results

The calculated SAR is obtained by the following formula:

$$\text{Reported SAR} = \text{Measured SAR} * 10^{(P_{\text{target}} - P_{\text{measured}})/10}$$

$$\text{Scaling factor} = 10^{(P_{\text{target}} - P_{\text{measured}})/10}$$

$$\text{Reported SAR} = \text{Measured SAR} * \text{Scaling factor}$$

Where P_{target} is the power of manufacturing upper limit;

P_{measured} is the measured power;

Measured SAR is measured SAR at measured power which including power drift)

Reported SAR which including Power Drift and Scaling factor

Duty Cycle

Test Mode	Duty Cycle
GSM (Voice)	1:8
GPRS850	1:2
GPRS1900	1:2
UMTS Band IV	1:1
UMTS Band V	1:1
LTE Band 2	1:1
LTE Band 4	1:1
LTE Band 12	1:1
2.4GWLAN	1:1

5.7. SAR Reporting Results

<Standalone SAR >

Table 7: SAR Values [GSM850 (GSM/GPRS/EGPRS)]

Ch.	Freq. (MHz)	Time slots	Test Position	Conducted Power (dBm)	Maximum Allowed Power (dBm)	Power drift	Scaling Factor	SAR _{1-g} results(W/Kg)		Graph Results
								Measured	Reported	
measured / reported SAR numbers - Head										
190	836.6	4Txslots	Left Cheek	27.92	28.00	0.10	1.019	0.324	0.330	
190	836.6	4Txslots	Left Tilt	27.92	28.00	-0.06	1.019	0.215	0.219	
190	836.6	4Txslots	Right Cheek	27.92	28.00	-0.14	1.019	0.342	0.348	Plot 1
190	836.6	4Txslots	Right Tilt	27.92	28.00	-0.08	1.019	0.271	0.276	
measured / reported SAR numbers - Body (distance 0mm)										
128	824.2	4Txslots	Test Position 1	27.79	28.00	0.08	1.050	0.871	0.915	
190	836.6	4Txslots		27.92	28.00	-0.01	1.019	0.936	0.954	Plot 2
251	848.8	4Txslots		27.70	28.00	-0.16	1.072	0.818	0.877	
128	824.2	4Txslots	Test Position 2	27.79	28.00	-0.12	1.050	0.866	0.909	
190	836.6	4Txslots		27.92	28.00	0.06	1.019	0.923	0.941	
251	848.8	4Txslots		27.70	28.00	0.04	1.072	0.797	0.854	
190	836.6	4Txslots	Test Position 3	27.92	28.00	-0.05	1.019	0.366	0.373	
128	824.2	4Txslots	Test Position 5	27.79	28.00	-0.18	1.050	0.852	0.895	
190	836.6	4Txslots		27.92	28.00	-0.13	1.019	0.912	0.929	
251	848.8	4Txslots		27.70	28.00	0.11	1.072	0.797	0.854	

Remark:

1. The value with block color is the maximum SAR Value of each test band.
2. The frame average of GPRS (4Tx slots) higher than GSM and sample can support VoIP function, tested at GPRS (4Tx slots) mode for head.
3. Per FCC KDB Publication 447498 D01, if the reported (scaled) SAR measured at the middle channel or highest output power channel for each test configuration is ≤ 0.8 W/kg then testing at the other channels is optional for such test configuration(s).

Table 8: SAR Values [GSM1900 (GSM/GPRS/EGPRS)]

Ch.	Freq. (MHz)	Time slots	Test Position	Conducted Power (dBm)	Maximum Allowed Power (dBm)	Power drift	Scaling Factor	SAR _{1-g} results(W/Kg)		Graph Results
								Measured	Reported	
measured / reported SAR numbers - Head										
661	1880.0	4Txslots	Left Cheek	25.96	26.00	-0.13	1.009	0.187	0.189	
661	1880.0	4Txslots	Left Tilt	25.96	26.00	-0.01	1.009	0.096	0.097	
661	1880.0	4Txslots	Right Cheek	25.96	26.00	-0.18	1.009	0.253	0.255	Plot 3
661	1880.0	4Txslots	Right Tilt	25.96	26.00	0.06	1.009	0.121	0.122	
measured / reported SAR numbers - Body (distance 0mm)										
661	1880.0	4Txslots	Test Position 1	25.96	26.00	-0.13	1.009	0.736	0.743	Plot 4
661	1880.0	4Txslots	Test Position 2	25.96	26.00	-0.17	1.009	0.732	0.739	
512	1850.2	4Txslots	Test Position 3	25.96	26.00	0.11	1.009	0.227	0.229	
661	1880.0	4Txslots	Test Position 5	25.96	26.00	0.03	1.009	0.721	0.727	

Remark:

1. The value with block color is the maximum SAR Value of each test band.
2. The frame average of GPRS (4Tx slots) higher than GSM and sample can support VoIP function, tested at GPRS (4Tx slots) mode for head.
3. Per FCC KDB Publication 447498 D01, if the reported (scaled) SAR measured at the middle channel or highest output power channel for each test configuration is ≤ 0.8 W/kg then testing at the other channels is optional for such test configuration(s).

Table 9: SAR Values [UMTS Band V (WCDMA/HSDPA/HSUPA)]

Ch.	Freq. (MHz)	Time slots	Test Position	Conducted Power (dBm)	Maximum Allowed Power (dBm)	Power drift	Scaling Factor	SAR _{1-g} results(W/Kg)		Graph Results
								Measured	Reported	
measured / reported SAR numbers - Head										
4233	846.6	RMC*	Left Cheek	23.45	24.00	-0.14	1.135	0.262	0.297	
4233	846.6	RMC*	Left Tilt	23.45	24.00	-0.07	1.135	0.161	0.183	
4233	846.6	RMC*	Right Cheek	23.45	24.00	-0.03	1.135	0.298	0.338	Plot 5
4233	846.6	RMC*	Right Tilt	23.45	24.00	-0.12	1.135	0.205	0.233	
measured / reported SAR numbers - Body (distance 0mm)										
4132	826.4	RMC*	Test Position 1	23.43	24.00	-0.11	1.140	0.704	0.803	
4183	836.6	RMC*		23.37	24.00	0.02	1.156	0.772	0.892	Plot 6
4233	846.6	RMC*		23.45	24.00	0.07	1.135	0.756	0.858	
4132	826.4	RMC*	Test Position 2	23.43	24.00	0.13	1.140	0.683	0.779	
4183	836.6	RMC*		23.37	24.00	-0.17	1.156	0.734	0.849	
4233	846.6	RMC*		23.45	24.00	-0.12	1.135	0.667	0.757	
4233	846.6	RMC*	Test Position 3	23.45	24.00	-0.11	1.135	0.328	0.372	
4132	826.4	RMC*	Test Position 5	23.43	24.00	-0.07	1.140	0.701	0.799	
4183	836.6	RMC*		23.37	24.00	-0.06	1.156	0.762	0.881	
4233	846.6	RMC*		23.45	24.00	-0.09	1.135	0.744	0.844	

Remark:

1. The value with block color is the maximum SAR Value of each test band.
2. Per FCC KDB Publication 447498 D01, if the reported (scaled) SAR measured at the middle channel or highest output power channel for each test configuration is ≤ 0.8 W/kg then testing at the other channels is optional for such test configuration(s).
3. RMC* - RMC 12.2kbps mode;

Table 9: SAR Values [UMTS Band IV (WCDMA/HSDPA/HSUPA)]

Ch.	Freq. (MHz)	Time slots	Test Position	Conducted Power (dBm)	Maximum Allowed Power (dBm)	Power drift	Scaling Factor	SAR _{1-g} results(W/Kg)		Graph Results
								Measured	Reported	
measured / reported SAR numbers - Head										
1513	1752.6	RMC*	Left Cheek	23.57	24.00	0.11	1.041	0.225	0.234	
1513	1752.6	RMC*	Left Tilt	23.57	24.00	-0.09	1.041	0.141	0.147	
1513	1752.6	RMC*	Right Cheek	23.57	24.00	0.17	1.041	0.258	0.269	Plot 7
1513	1752.6	RMC*	Right Tilt	23.57	24.00	0.03	1.041	0.149	0.155	
measured / reported SAR numbers - Body (distance 0mm)										
1312	1712.4	RMC*	Test Position 1	23.40	24.00	0.07	1.148	0.646	0.742	
1413	1732.6	RMC*		23.50	24.00	0.04	1.122	0.715	0.802	
1513	1752.6	RMC*		23.57	24.00	-0.11	1.041	0.782	0.814	Plot 8
1513	1752.6	RMC*	Test Position 2	23.57	24.00	-0.01	1.041	0.746	0.777	
1513	1752.6	RMC*	Test Position 3	23.57	24.00	0.06	1.041	0.226	0.235	
1513	1752.6	RMC*	Test Position 5	23.57	24.00	-0.17	1.041	0.755	0.786	

Remark:

1. The value with block color is the maximum SAR Value of each test band.
2. Per FCC KDB Publication 447498 D01, if the reported (scaled) SAR measured at the middle channel or highest output power channel for each test configuration is ≤ 0.8 W/kg then testing at the other channels is optional for such test configuration(s).
3. RMC* - RMC 12.2kbps mode;

Table 11: SAR Values [LTE Band 2]

Ch.	Freq. (MHz)	Channel Type (20M)	Test Position	Conducted Power (dBm)	Maximum Allowed Power (dBm)	Power Drift (%)	Scaling Factor	SAR _{1-g} results(W/kg)		Graph Results
								Measured	Reported	
measured / reported SAR numbers - Head										
18700	1860.0	1RB	Left Cheek	22.89	23.00	-0.13	1.026	0.130	0.133	Plot 9
18700	1860.0	1RB	Left Tilt	22.89	23.00	-0.05	1.026	0.081	0.083	
18700	1860.0	1RB	Right Cheek	22.89	23.00	0.18	1.026	0.147	0.151	
18700	1860.0	1RB	Right Tilt	22.89	23.00	0.04	1.026	0.088	0.090	
18700	1860.0	50%RB	Left Cheek	21.90	22.00	-0.11	1.023	0.107	0.109	
18700	1860.0	50%RB	Left Tilt	21.90	22.00	-0.06	1.023	0.066	0.068	
18700	1860.0	50%RB	Right Cheek	21.90	22.00	-0.03	1.023	0.115	0.118	
18700	1860.0	50%RB	Right Tilt	21.90	22.00	0.07	1.023	0.071	0.073	
measured / reported SAR numbers - Body (distance 0mm)										
18700	1860.0	1RB	Test Position 1	22.89	23.00	-0.12	1.026	0.772	0.792	Plot 10
18700	1860.0	1RB	Test Position 2	22.89	23.00	-0.05	1.026	0.706	0.724	
18700	1860.0	1RB	Test Position 3	22.89	23.00	0.04	1.026	0.203	0.208	
18700	1860.0	1RB	Test Position 5	22.89	23.00	0.05	1.026	0.760	0.780	
18700	1860.0	50%RB	Test Position 1	21.90	22.00	-0.05	1.023	0.517	0.529	
18700	1860.0	50%RB	Test Position 2	21.90	22.00	0.01	1.023	0.498	0.509	
18700	1860.0	50%RB	Test Position 3	21.90	22.00	0.09	1.023	0.187	0.191	
18700	1860.0	50%RB	Test Position 5	21.90	22.00	-0.14	1.023	0.506	0.518	

Remark:

1. The value with block color is the maximum SAR Value of each test band.
2. Per FCC KDB Publication 447498 D01, if the reported (scaled) SAR measured at the middle channel or highest output power channel for each test configuration is ≤ 0.8 W/kg then testing at the other channels is optional for such test configuration(s).

Table 12: SAR Values [LTE Band 4]

Ch.	Freq. (MHz)	Channel Type (20M)	Test Position	Conducted Power (dBm)	Maximum Allowed Power (dBm)	Power Drift (%)	Scaling Factor	SAR _{1-g} results(W/kg)		Graph Results
								Measured	Reported	
measured / reported SAR numbers - Head										
20050	1720.0	1RB	Left Cheek	22.73	23.00	0.02	1.064	0.206	0.219	Plot 11
20050	1720.0	1RB	Left Tilt	22.73	23.00	-0.11	1.064	0.135	0.144	
20050	1720.0	1RB	Right Cheek	22.73	23.00	-0.06	1.064	0.237	0.252	
20050	1720.0	1RB	Right Tilt	22.73	23.00	0.04	1.064	0.144	0.153	
20175	1732.5	50%RB	Left Cheek	21.81	22.00	0.03	1.045	0.161	0.168	
20175	1732.5	50%RB	Left Tilt	21.81	22.00	-0.12	1.045	0.095	0.099	
20175	1732.5	50%RB	Right Cheek	21.81	22.00	-0.15	1.045	0.176	0.184	
20175	1732.5	50%RB	Right Tilt	21.81	22.00	-0.04	1.045	0.109	0.114	
measured / reported SAR numbers - Body (distance 0mm)										
20050	1720.0	1RB	Test Position 1	22.73	23.00	0.04	1.064	0.717	0.763	Plot 12
20050	1720.0	1RB	Test Position 2	22.73	23.00	-0.07	1.064	0.698	0.743	
20050	1720.0	1RB	Test Position 3	22.73	23.00	-0.01	1.064	0.215	0.229	
20050	1720.0	1RB	Test Position 5	22.73	23.00	0.08	1.064	0.708	0.753	
20175	1732.5	50%RB	Test Position 1	21.81	22.00	0.01	1.045	0.644	0.673	
20175	1732.5	50%RB	Test Position 2	21.81	22.00	0.17	1.045	0.599	0.626	
20175	1732.5	50%RB	Test Position 3	21.81	22.00	-0.12	1.045	0.167	0.175	
20175	1732.5	50%RB	Test Position 5	21.81	22.00	-0.15	1.045	0.636	0.665	

Remark:

1. The value with block color is the maximum SAR Value of each test band.
2. Per FCC KDB Publication 447498 D01, if the reported (scaled) SAR measured at the middle channel or highest output power channel for each test configuration is ≤ 0.8 W/kg then testing at the other channels is optional for such test configuration(s).

Table 13: SAR Values [LTE Band 12]

Ch.	Freq. (MHz)	Channel Type (20M)	Test Position	Conducted Power (dBm)	Maximum Allowed Power (dBm)	Power Drift (%)	Scaling Factor	SAR _{1-g} results(W/kg)		Graph Results
								Measured	Reported	
measured / reported SAR numbers - Head										
23095	707.5	1RB	Left Cheek	22.98	23.00	-0.04	1.005	0.312	0.314	
23095	707.5	1RB	Left Tilt	22.98	23.00	-0.16	1.005	0.255	0.256	
23095	707.5	1RB	Right Cheek	22.98	23.00	0.11	1.005	0.344	0.346	Plot 13
23095	707.5	1RB	Right Tilt	22.98	23.00	0.05	1.005	0.282	0.283	
23130	713.5	50%RB	Left Cheek	21.98	22.00	-0.09	1.005	0.266	0.267	
23130	713.5	50%RB	Left Tilt	21.98	22.00	-0.12	1.005	0.171	0.172	
23130	713.5	50%RB	Right Cheek	21.98	22.00	0.03	1.005	0.283	0.284	
23130	713.5	50%RB	Right Tilt	21.98	22.00	0.05	1.005	0.179	0.180	
measured / reported SAR numbers - Body (distance 0mm)										
23060	704.0	1RB	Test Position 1	22.96	23.00	0.04	1.009	0.875	0.883	
23095	707.5	1RB		22.98	23.00	0.01	1.005	0.974	0.979	Plot 14
23130	713.5	1RB		22.96	23.00	0.12	1.009	0.958	0.967	
23060	704.0	1RB	Test Position 2	22.96	23.00	-0.04	1.009	0.788	0.795	
23095	707.5	1RB		22.98	23.00	-0.16	1.005	0.818	0.822	
23130	713.5	1RB		22.96	23.00	0.11	1.009	0.807	0.814	
23095	707.5	1RB	Test Position 3	22.98	23.00	0.02	1.005	0.336	0.338	
23060	704.0	1RB	Test Position 5	22.96	23.00	0.01	1.009	0.739	0.746	
23095	707.5	1RB		22.98	23.00	0.05	1.005	0.815	0.819	
23130	713.5	1RB		22.96	23.00	0.17	1.009	0.806	0.813	
23130	713.5	50%RB	Test Position 1	21.98	22.00	-0.10	1.005	0.782	0.786	
23130	713.5	50%RB	Test Position 2	21.98	22.00	-0.09	1.005	0.724	0.728	
23130	713.5	50%RB	Test Position 3	21.98	22.00	0.13	1.005	0.183	0.184	
23130	713.5	50%RB	Test Position 5	21.98	22.00	0.01	1.005	0.737	0.741	

Remark:

1. The value with block color is the maximum SAR Value of each test band.
2. Per FCC KDB Publication 447498 D01, if the reported (scaled) SAR measured at the middle channel or highest output power channel for each test configuration is ≤ 0.8 W/kg then testing at the other channels is optional for such test configuration(s).

Table 13: SAR Values [2.4GWLAN IEEE 802.11b]

Ch.	Freq. (MHz)	Mode	Test Position	Conducted Power (dBm)	Maximum Allowed Power (dBm)	Power drift	Scaling Factor	SAR _{1-g} results(W/Kg)		Graph Results
								Measured	Reported	
measured / reported SAR numbers - Head										
11	2462	DSSS	Left Cheek	12.78	13.00	0.01	1.052	0.445	0.468	
11	2462	DSSS	Left Tilt	12.78	13.00	-0.05	1.052	0.315	0.331	
11	2462	DSSS	Right Cheek	12.78	13.00	-0.12	1.052	0.664	0.699	Plot 15
11	2462	DSSS	Right Tilt	12.78	13.00	-0.16	1.052	0.416	0.438	
measured / reported SAR numbers - Body (distance 0mm)										
11	2462	DSSS	Test Position 1	12.78	13.00	0.14	1.052	0.497	0.523	Plot 16
11	2462	DSSS	Test Position 3	12.78	13.00	-0.02	1.052	0.471	0.495	
11	2462	DSSS	Test Position 4	12.78	13.00	0.05	1.052	0.485	0.510	

Remark:

1. The value with blue color is the maximum SAR Value of each test band.
2. Per FCC KDB Publication 447498 D01, if the reported (scaled) SAR measured at the middle channel or highest output power channel for each test configuration is ≤ 0.8 W/kg then testing at the other channels is optional for such test configuration(s).
3. SAR is not required for the following 2.4 GHz OFDM conditions as the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is 0.555 $[0.699 \times (15.85/19.95)] \leq 1.2$ W/Kg.

5.8. Simultaneous TX SAR Considerations

5.8.1 Introduction

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

For the DUT, BT and 2.4GWLAN modules sharing same antenna, GSM and UMTS module sharing a single antenna; 2.4GWLAN/BT and GSM/UMTS share difference antenna, can simultaneous transmit, need consider simultaneous.

Application Simultaneous Transmission information:

Air-Interface	Band (MHz)	Type	Simultaneous Transmissions	Voice over Digital Transport (Data)
GSM/UMTS/LTE	850	VO	Yes, WLAN or BT	N/A
	1900	VO		
	850/1700/1900/700	DT	Yes, WLAN or BT	N/A
WLAN	2450	DT	Yes, GSM, GPRS, EGPRS, UMTS, LTE	Yes
BT	2450	DT	Yes, GSM, GPRS, EGPRS, UMTS, LTE	N/A

Note: VO-Voice Service only; DT-Digital Transport

Remark:

1. BT and WLAN can be active at the same time, but only with interleaving of packages switched on board level. That means that they don't transmit at the same time.

5.8.2 Evaluation of Simultaneous SAR

The following tables list information which is relevant for the decision if a simultaneous transmit evaluation is necessary according to FCC KDB 447498D01 General RF Exposure Guidance v06.

Head Exposure Conditions

reported SAR WWAN and WLAN 2.4GHz, ΣSAR evaluation, SPLSRi						
Frequency band	Position	SAR _{1-gmax} /W/kg		ΣSAR <1.6W/Kg	Distance Ri, mm	Ratio ≤ 0.040
		WWAN	WLAN			
GSM 850	Left Cheek	0.330	0.468	0.798		
	Left Tilt	0.219	0.331	0.550		
	Right Cheek	0.348	0.699	1.047		
	Right Tilt	0.276	0.438	0.714		
GSM 1900	Left Cheek	0.189	0.468	0.657		
	Left Tilt	0.097	0.331	0.428		
	Right Cheek	0.255	0.699	0.954		
	Right Tilt	0.122	0.438	0.560		

reported SAR WWAN and WLAN 2.4GHz, ΣSAR evaluation, SPLSRi						
Frequency band	Position	SAR _{1-gmax} /W/kg		ΣSAR <1.6W/Kg	Distance Ri, mm	Ratio ≤ 0.040
		WWAN	WLAN			
UMTS Band V	Left Cheek	0.297	0.468	0.765		
	Left Tilt	0.183	0.331	0.514		
	Right Cheek	0.338	0.699	1.037		
	Right Tilt	0.233	0.438	0.671		
UMTS Band IV	Left Cheek	0.234	0.468	0.702		
	Left Tilt	0.147	0.331	0.478		
	Right Cheek	0.269	0.699	0.968		
	Right Tilt	0.155	0.438	0.593		

reported SAR WWAN and WLAN 2.4GHz, ΣSAR evaluation, SPLSRi						
Frequency band	Position	SAR _{1-gmax} /W/kg		ΣSAR <1.6W/Kg	Distance Ri, mm	Ratio ≤ 0.040
		WWAN	WLAN			
LTE Band 2	Left Cheek	0.133	0.468	0.601		
	Left Tilt	0.083	0.331	0.414		
	Right Cheek	0.151	0.699	0.850		
	Right Tilt	0.090	0.438	0.528		
LTE Band 4	Left Cheek	0.219	0.468	0.687		
	Left Tilt	0.144	0.331	0.475		
	Right Cheek	0.252	0.699	0.951		
	Right Tilt	0.153	0.438	0.591		
LTE Band 12	Left Cheek	0.314	0.468	0.782		
	Left Tilt	0.256	0.331	0.587		
	Right Cheek	0.346	0.699	1.045		
	Right Tilt	0.283	0.438	0.721		

reported SAR WWAN and BT, ΣSAR evaluation, SPLSRi						
Frequency band	Position	SAR _{1-gmax} /W/kg		ΣSAR <1.6W/Kg	Distance Ri, mm	Ratio ≤ 0.040
		WWAN	BT			
GSM 850	Left Cheek	0.330	0.066	0.396		
	Left Tilt	0.219	0.066	0.285		
	Right Cheek	0.348	0.066	0.414		
	Right Tilt	0.276	0.066	0.342		
GSM 1900	Left Cheek	0.189	0.066	0.255		
	Left Tilt	0.097	0.066	0.163		
	Right Cheek	0.255	0.066	0.321		
	Right Tilt	0.122	0.066	0.188		

reported SAR WWAN and BT, ΣSAR evaluation, SPLSRi						
Frequency band	Position	SAR _{1-gmax} /W/kg		ΣSAR <1.6W/Kg	Distance Ri, mm	Ratio ≤ 0.040
		WWAN	BT			
UMTS Band V	Left Cheek	0.297	0.066	0.363		
	Left Tilt	0.183	0.066	0.249		
	Right Cheek	0.338	0.066	0.404		
	Right Tilt	0.233	0.066	0.299		
UMTS Band IV	Left Cheek	0.234	0.066	0.300		
	Left Tilt	0.147	0.066	0.213		
	Right Cheek	0.269	0.066	0.335		
	Right Tilt	0.155	0.066	0.221		

reported SAR WWAN and BT, ΣSAR evaluation, SPLSRi						
Frequency band	Position	SAR _{1-gmax} /W/kg		ΣSAR <1.6W/Kg	Distance Ri, mm	Ratio ≤ 0.040
		WWAN	BT			
LTE Band 2	Left Cheek	0.133	0.066	0.199		
	Left Tilt	0.083	0.066	0.149		
	Right Cheek	0.151	0.066	0.217		
	Right Tilt	0.090	0.066	0.156		
LTE Band 4	Left Cheek	0.219	0.066	0.285		
	Left Tilt	0.144	0.066	0.210		
	Right Cheek	0.252	0.066	0.318		
	Right Tilt	0.153	0.066	0.219		
LTE Band 12	Left Cheek	0.314	0.066	0.380		
	Left Tilt	0.256	0.066	0.322		
	Right Cheek	0.346	0.066	0.412		
	Right Tilt	0.283	0.066	0.349		

Body Exposure Conditions

reported SAR WWAN and WLAN 2.4GHz, Σ SAR evaluation, SPLSRi						
Frequency band	Position	SAR _{1-gmax} /W/kg		Σ SAR <1.6W/Kg	Distance Ri, mm	Ratio ≤ 0.040
		WWAN	WLAN			
GSM 850	Test Position 1	0.954	0.523	1.477		
	Test Position 2	0.941	N/A	0.941		
	Test Position 3	0.373	0.495	0.868		
	Test Position 4	N/A	0.510	0.510		
	Test Position 5	0.929	N/A	0.929		
GSM 1900	Test Position 1	0.743	0.523	1.266		
	Test Position 2	0.739	N/A	0.739		
	Test Position 3	0.229	0.495	0.724		
	Test Position 4	N/A	0.510	0.510		
	Test Position 5	0.727	N/A	0.727		

reported SAR WWAN and WLAN 2.4GHz, Σ SAR evaluation, SPLSRi						
Frequency band	Position	SAR _{1-gmax} /W/kg		Σ SAR <1.6W/Kg	Distance Ri, mm	Ratio ≤ 0.040
		WWAN	WLAN			
UMTS Band V	Test Position 1	0.892	0.523	1.415		
	Test Position 2	0.849	N/A	0.849		
	Test Position 3	0.372	0.495	0.867		
	Test Position 4	N/A	0.510	0.510		
	Test Position 5	0.881	N/A	0.881		
UMTS Band IV	Test Position 1	0.814	0.523	1.337		
	Test Position 2	0.777	N/A	0.777		
	Test Position 3	0.235	0.495	0.730		
	Test Position 4	N/A	0.510	0.510		
	Test Position 5	0.786	N/A	0.786		

reported SAR WWAN and WLAN 2.4GHz, Σ SAR evaluation, SPLSRi						
Frequency band	Position	SAR _{1-gmax} /W/kg		Σ SAR <1.6W/Kg	Distance Ri, mm	Ratio ≤ 0.040
		WWAN	WLAN			
LTE Band 2	Test Position 1	0.792	0.523	1.315		
	Test Position 2	0.724	N/A	0.724		
	Test Position 3	0.208	0.495	0.703		
	Test Position 4	N/A	0.510	0.510		
	Test Position 5	0.780	N/A	0.780		
LTE Band 4	Test Position 1	0.763	0.523	1.286		
	Test Position 2	0.743	N/A	0.743		
	Test Position 3	0.229	0.495	0.724		
	Test Position 4	N/A	0.510	0.510		
	Test Position 5	0.753	N/A	0.753		
LTE Band 12	Test Position 1	0.979	0.523	1.502		
	Test Position 2	0.822	N/A	0.822		
	Test Position 3	0.338	0.495	0.835		
	Test Position 4	N/A	0.510	0.510		
	Test Position 5	0.819	N/A	0.819		

reported SAR WWAN and BT, Σ SAR evaluation, SPLSRi						
Frequency band	Position	SAR _{1-gmax} /W/kg		Σ SAR <1.6W/Kg	Distance Ri, mm	Ratio ≤ 0.040
		WWAN	BT			
GSM 850	Test Position 1	0.954	0.066	1.020		
	Test Position 2	0.941	N/A	0.941		
	Test Position 3	0.373	0.066	0.439		
	Test Position 4	N/A	0.066	0.066		
	Test Position 5	0.929	N/A	0.929		
GSM 1900	Test Position 1	0.743	0.066	0.809		
	Test Position 2	0.739	N/A	0.739		
	Test Position 3	0.229	0.066	0.295		
	Test Position 4	N/A	0.066	0.066		
	Test Position 5	0.727	N/A	0.727		

reported SAR WWAN and BT, Σ SAR evaluation, SPLSRi						
Frequency band	Position	SAR _{1-gmax} /W/kg		Σ SAR <1.6W/Kg	Distance Ri, mm	Ratio ≤ 0.040
		WWAN	BT			
UMTS Band V	Test Position 1	0.892	0.066	0.958		
	Test Position 2	0.849	N/A	0.849		
	Test Position 3	0.372	0.066	0.438		
	Test Position 4	N/A	0.066	0.066		
	Test Position 5	0.881	N/A	0.881		
UMTS Band IV	Test Position 1	0.814	0.066	0.880		
	Test Position 2	0.777	N/A	0.777		
	Test Position 3	0.235	0.066	0.301		
	Test Position 4	N/A	0.066	0.066		
	Test Position 5	0.786	N/A	0.786		

reported SAR WWAN and BT, Σ SAR evaluation, SPLSRi						
Frequency band	Position	SAR _{1-gmax} /W/kg		Σ SAR <1.6W/Kg	Distance Ri, mm	Ratio ≤ 0.040
		WWAN	BT			
LTE Band 2	Test Position 1	0.792	0.066	0.858		
	Test Position 2	0.724	N/A	0.724		
	Test Position 3	0.208	0.066	0.274		
	Test Position 4	N/A	0.066	0.066		
	Test Position 5	0.780	N/A	0.780		
LTE Band 4	Test Position 1	0.763	0.066	0.829		
	Test Position 2	0.743	N/A	0.743		
	Test Position 3	0.229	0.066	0.299		
	Test Position 4	N/A	0.066	0.066		
	Test Position 5	0.753	N/A	0.753		
LTE Band 12	Test Position 1	0.979	0.066	1.045		
	Test Position 2	0.822	N/A	0.822		
	Test Position 3	0.338	0.066	0.404		
	Test Position 4	N/A	0.066	0.066		
	Test Position 5	0.819	N/A	0.819		

Remark:

1. BT and WLAN can be active at the same time, but only with interleaving of packages switched on board level. That means that they don't transmit at the same time.
2. The value with block color is the maximum values of standalone
3. The value with blue color is the maximum values of Σ SAR_{1-g}

5.9. SAR Measurement Variability

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

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

The same procedures should be adapted for measurements according to extremity and occupational exposure limits by applying a factor of 2.5 for extremity exposure and a factor of 5 for occupational exposure to the corresponding SAR thresholds.

Thus the following procedures are applied to determine if repeated measurements are required for occupational exposure.

- 5) Repeated measurement is not required when the original highest measured SAR is < 4.00 W/kg; steps 6) through 8) do not apply.

- 6) When the original highest measured SAR is ≥ 4.00 W/kg, repeat that measurement once.
- 7) Perform a second repeated measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is > 6.00 or when the original or repeated measurement is ≥ 7.25 W/kg (~10% from the 1-g SAR limit).
- 8) Perform a third repeated measurement only if the original, first or second repeated measurement is ≥ 7.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20 .

Frequency (MHz)	Air Interface	RF Exposure Configuration	Test Position	Repeated SAR (yes/no)	Highest SAR _{1-g} (W/Kg)	First Repeated	
						SAR _{1-g} (W/Kg)	Largest to Smallest SAR Ratio
750	LTE Band 12	Standalone	Test Position 1	yes	0.974	0.982	1.01
850	GSM850	Standalone	Test Position 1	yes	0.936	0.920	0.98
	UMTS Band V	Standalone	Test Position 1	no	0.772		
1750	UMTS Band IV	Standalone	Test Position 1	no	0.782		
	LTE Band 4	Standalone	Test Position 1	no	0.717		
1900	GSM190	Standalone	Test Position 1	no	0.736		
	LTE Band 2	Standalone	Test Position 1	no	0.772		
2450	2.4GWLAN	Standalone	Test Position 1	no	0.517		

Remark:

1. Second Repeated Measurement is not required since the ratio of the largest to smallest SAR for the original and first repeated measurement is not > 1.20 or 3 (1-g or 10-g respectively)

5.10. Measurement Uncertainty (300-3000MHz)

Not required as SAR measurement uncertainty analysis is required in SAR reports only when the highest measured SAR in a frequency band is ≥ 1.5 W/kg for 1-g SAR according to KDB865664D01.

5.11. System Check Results

System Performance Check at 835 MHz Head TSL

DUT: Dipole 835 MHz; Type: D835V2; Serial: 4d141

Date/Time: 06/26/2017 08:15:17 AM

Communication System: DuiJiangJi; Frequency: 835 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 835$ MHz; $\sigma = 0.91$ S/m; $\epsilon_r = 41.9$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

Probe: ES3DV3 - SN3292; ConvF(6.53, 6.53, 6.53); Calibrated: 09/02/2016;

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1315; Calibrated: 07/26/2016

Phantom: SAM 1; Type: SAM;

Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

System Performance Check at 835MHz/Area Scan (61x111x1): Interpolated grid: dx=1.50 mm, dy=1.50 mm

Maximum value of SAR (interpolated) = 1.12 mW/g

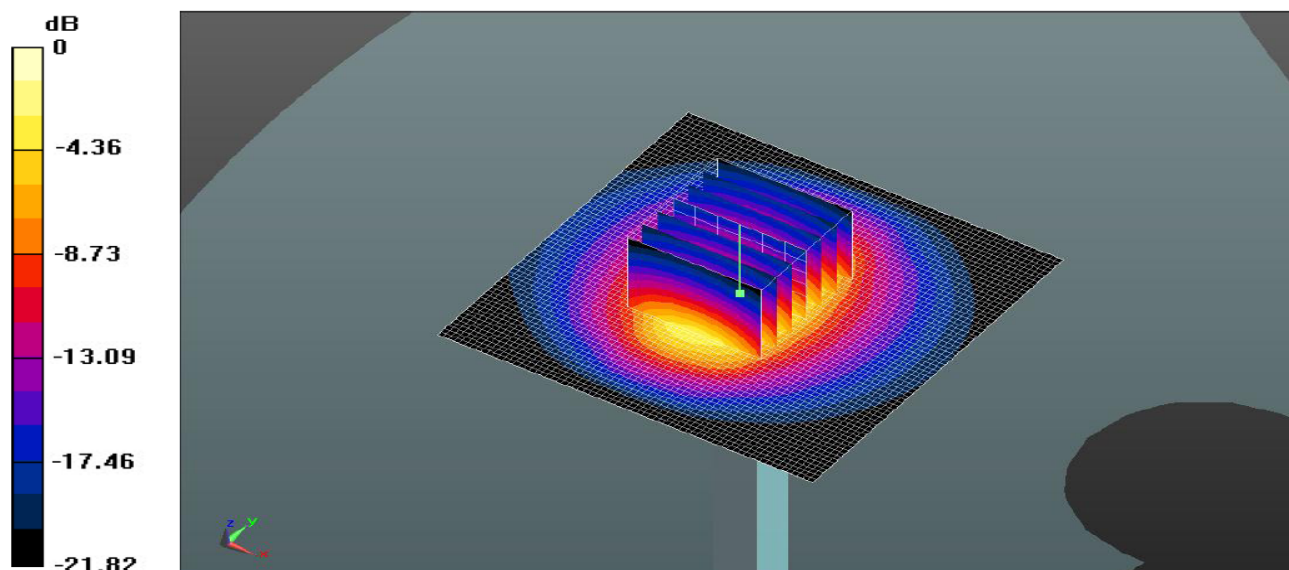
System Performance Check at 835MHz/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 37.10 V/m; Power Drift = 0.08 dB

Peak SAR (extrapolated) = 1.35 mW/g

SAR(1 g) = 0.972 mW/g; SAR(10 g) = 0.698 mW/g

Maximum value of SAR (measured) = 1.24 mW/g



0 dB = 1.24 mW/g = 0.94 dB mW/g

System Performance Check 835MHz Head 100mW

System Performance Check at 835 MHz Body TSL

DUT: Dipole 835 MHz; Type: D835V2; Serial: 4d141

Date/Time: 06/27/2017 07:58:24 AM

Communication System: DuiJiangJi; Frequency: 835 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 835$ MHz; $\sigma = 0.95$ S/m; $\epsilon_r = 54.4$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

Probe: ES3DV3 - SN3292; ConvF(6.27, 6.27, 6.27); Calibrated: 09/02/2016;

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1315; Calibrated: 07/26/2016

Phantom: ELI 4.0; Type: QDOVA001BA;

Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

System Performance Check at 835MHz/Area Scan (61x111x1): Interpolated grid: dx=1.50 mm, dy=1.50 mm

Maximum value of SAR (interpolated) = 1.12 mW/g

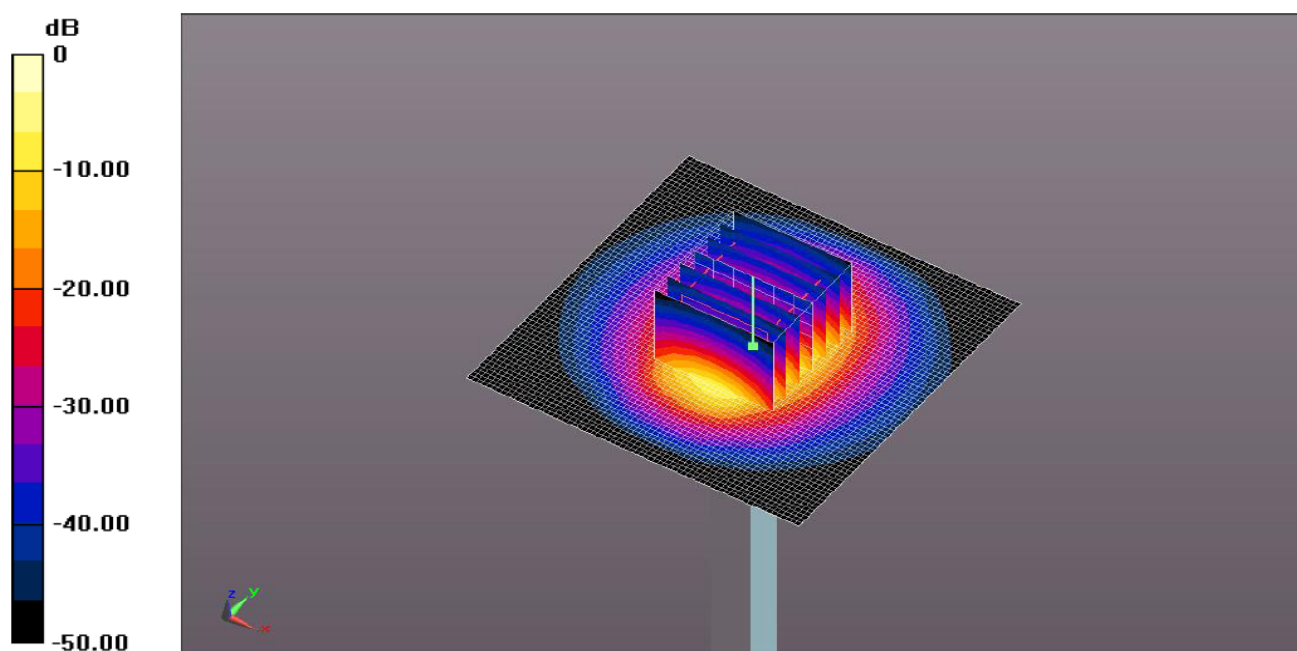
System Performance Check at 835MHz/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 37.08 V/m; Power Drift = 0.10 dB

Peak SAR (extrapolated) = 1.41 mW/g

SAR(1 g) = 0.977 mW/g; SAR(10 g) = 0.696 mW/g

Maximum value of SAR (measured) = 1.24 mW/g



0 dB = 1.24 mW/g = 0.94 dB mW/g

System Performance Check at 1900 MHz Head TSL

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: 5d162

Date/Time: 06/26/2017 14:44:07 PM

Communication System: DuiJiangJi; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 1900$ MHz; $\sigma = 1.43$ S/m; $\epsilon_r = 40.8$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

Probe: ES3DV3 - SN3292; ConvF(5.26, 5.26, 5.26); Calibrated: 09/02/2016;

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1315; Calibrated: 07/26/2016

Phantom: SAM 1; Type: SAM;

Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

System Performance Check at 1900MHz/Area Scan (61x111x1): Interpolated grid: dx=1.50 mm, dy=1.50 mm

Maximum value of SAR (interpolated) = 5.56 mW/g

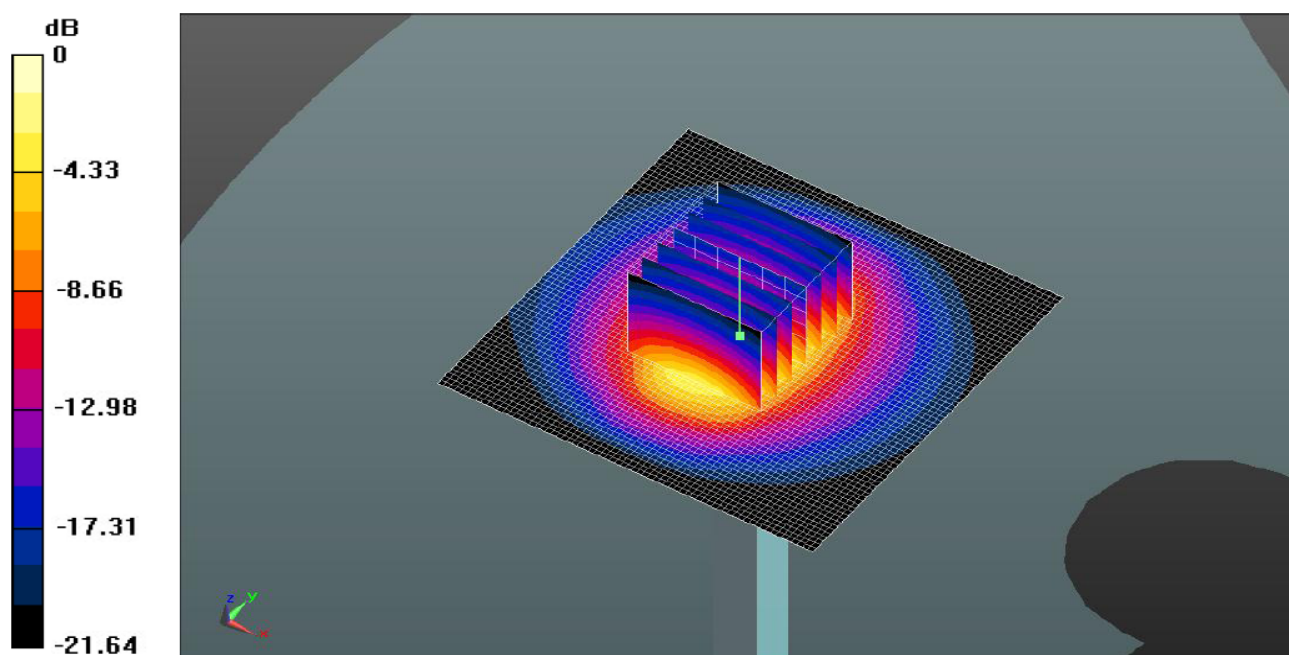
System Performance Check at 1900MHz/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 58.487 V/m; Power Drift = 0.09 dB

Peak SAR (extrapolated) = 6.84 mW/g

SAR(1 g) = 4.16 mW/g; SAR(10 g) = 2.07 mW/g

Maximum value of SAR (measured) = 5.66 mW/g



0 dB = 5.66 mW/g = 7.52 dB mW/g

System Performance Check 1900MHz Head 100mW

System Performance Check at 1900 MHz Body TSL

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: 5d162

Date/Time: 06/29/2017 08:12:27 AM

Communication System: DuiJiangJi; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 1900$ MHz; $\sigma = 1.50$ S/m; $\epsilon_r = 54.1$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

Probe: ES3DV3 - SN3292; ConvF(5.05, 5.05, 5.05); Calibrated: 09/02/2016;

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1315; Calibrated: 07/26/2016

Phantom: ELI 4.0; Type: QDOVA001BA;

Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

System Performance Check at 1900MHz/Area Scan (61x111x1): Interpolated grid: $dx=1.50$ mm, $dy=1.50$ mm

Maximum value of SAR (interpolated) = 5.52 mW/g

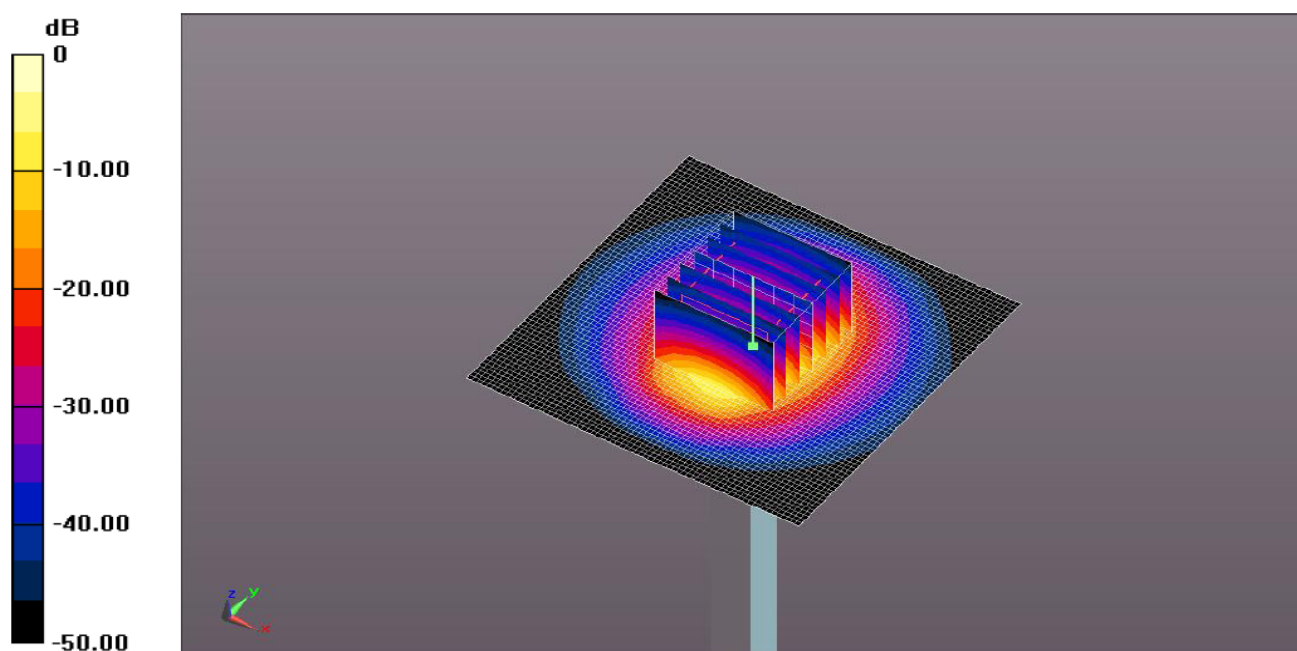
System Performance Check at 1900MHz/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8$ mm, $dy=8$ mm, $dz=5$ mm

Reference Value = 58.122 V/m; Power Drift = 0.12 dB

Peak SAR (extrapolated) = 7.28 mW/g

SAR(1 g) = 4.22 mW/g; SAR(10 g) = 1.97 mW/g

Maximum value of SAR (measured) = 7.26 mW/g



0 dB = 7.26 mW/g = 8.61 dB mW/g

System Performance Check at 2450 MHz Head TSL

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: 816

Date/Time: 06/26/2017 19:42:22 PM

Communication System: DuiJiangJi; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 2450$ MHz; $\sigma = 1.83$ S/m; $\epsilon_r = 39.7$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

Probe: ES3DV3 - SN3292; ConvF(4.97, 4.97, 4.97); Calibrated: 09/02/2016;

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1315; Calibrated: 07/26/2016

Phantom: SAM 1; Type: SAM;

Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

System Performance Check at 2450MHz/Area Scan (81x111x1): Interpolated grid: dx=1.20 mm, dy=1.20 mm

Maximum value of SAR (interpolated) = 6.51 mW/g

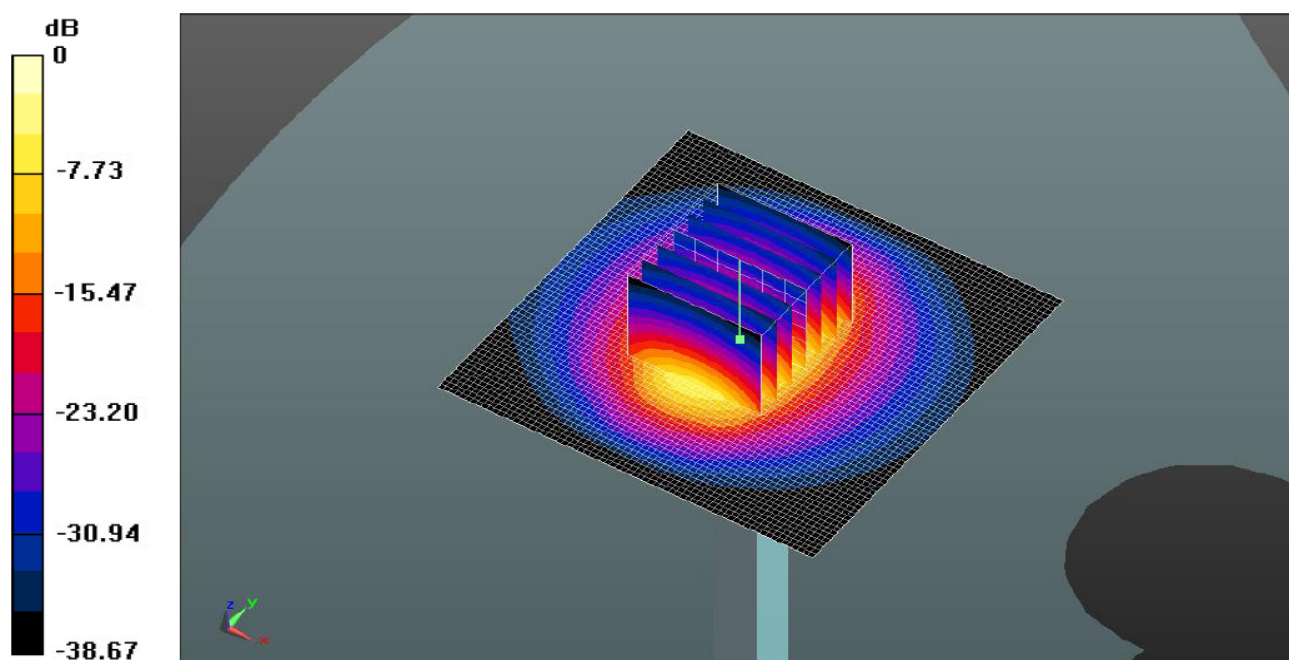
System Performance Check at 2450MHz/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 73.449 V/m; Power Drift = 0.16 dB

Peak SAR (extrapolated) = 9.41 mW/g

SAR(1 g) = 5.24 mW/g; SAR(10 g) = 2.81 mW/g

Maximum value of SAR (measured) = 7.28 mW/g



0 dB = 7.28 mW/g = 8.62 dB mW/g

System Performance Check at 2450 MHz Body TSL

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: 816

Date/Time: 07/01/2017 09:34:14 AM

Communication System: DuiJiangJi; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 2450$ MHz; $\sigma = 1.93$ S/m; $\epsilon_r = 53.4$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

Probe: ES3DV3 - SN3292; ConvF(4.70, 4.70, 4.70); Calibrated: 09/02/2016;

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1315; Calibrated: 07/26/2016

Phantom: ELI 4.0; Type: QDOVA001BA;

Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

System Performance Check at 2450MHz/Area Scan (81x111x1): Interpolated grid: dx=1.20 mm, dy=1.20 mm

Maximum value of SAR (interpolated) = 6.42 mW/g

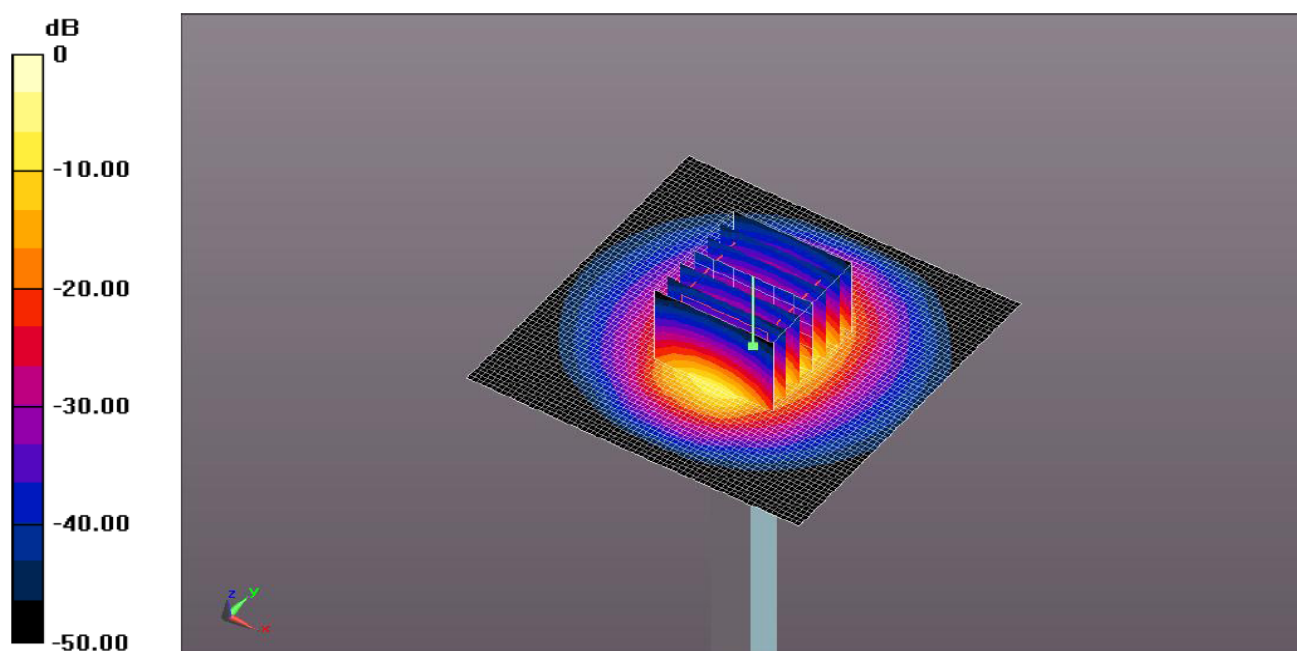
System Performance Check at 2450MHz/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 73.214V/m; Power Drift = 0.12 dB

Peak SAR (extrapolated) = 8.46 mW/g

SAR(1 g) = 5.21 mW/g; SAR(10 g) = 2.89 mW/g

Maximum value of SAR (measured) = 7.06 mW/g



0 dB = 7.06 mW/g = 8.49 dB mW/g

System Performance Check at 750 MHz Head TSL

DUT: Dipole 750 MHz; Type: D750V3; Serial: 1163

Date/Time: 07/02/2017 07:44:39 AM

Communication System: DuiJiangJi; Frequency: 750 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 750$ MHz; $\sigma = 0.91$ S/m; $\epsilon_r = 42.5$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

Probe: ES3DV3 - SN3292; ConvF(6.76, 6.76, 6.76); Calibrated: 09/02/2016;

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1315; Calibrated: 07/26/2016

Phantom: SAM 1; Type: SAM;

Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

System Performance Check at 750MHz/Area Scan (61x111x1): Interpolated grid: dx=1.50 mm, dy=1.50 mm

Maximum value of SAR (interpolated) = 1.07 mW/g

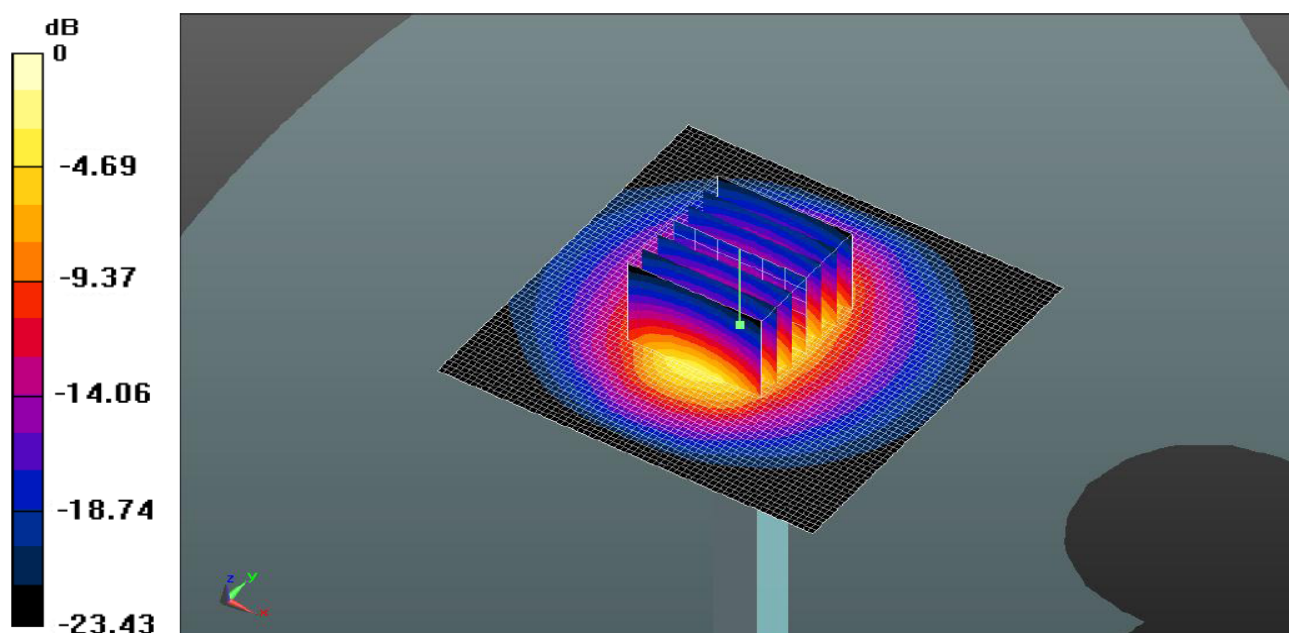
System Performance Check at 750MHz/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 35.881 V/m; Power Drift = -0.07 dB

Peak SAR (extrapolated) = 1.21 mW/g

SAR(1 g) = 0.838 mW/g; SAR(10 g) = 0.622 mW/g

Maximum value of SAR (measured) = 1.12 mW/g



0 dB = 1.12 mW/g = 0.49 dB mW/g

System Performance Check 750MHz Head 100mW

System Performance Check at 750 MHz Body TSL

DUT: Dipole 750 MHz; Type: D750V3; Serial: 1163

Date/Time: 07/02/2017 14:51:07 PM

Communication System: DuiJiangJi; Frequency: 750 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 750$ MHz; $\sigma = 0.97$ S/m; $\epsilon_r = 56.1$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

Probe: ES3DV3 - SN3292; ConvF(6.25, 6.25, 6.25); Calibrated: 09/02/2016;

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1315; Calibrated: 07/26/2016

Phantom: ELI 4.0; Type: QDOVA001BA;

Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

System Performance Check at 750MHz/Area Scan (61x111x1): Interpolated grid: dx=1.50 mm, dy=1.50 mm

Maximum value of SAR (interpolated) = 0.977 mW/g

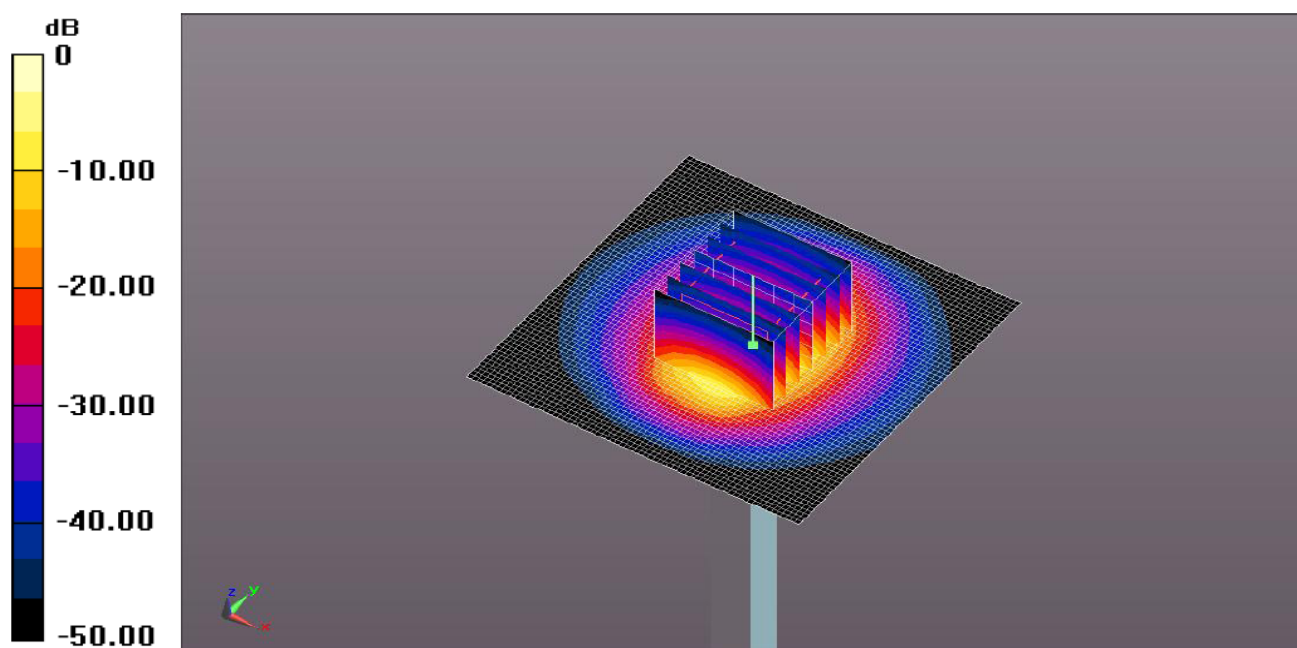
System Performance Check at 750MHz/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 35.927 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 1.21 mW/g

SAR(1 g) = 0.856 mW/g; SAR(10 g) = 0.607 mW/g

Maximum value of SAR (measured) = 1.24 mW/g



0 dB = 1.24 mW/g = 0.94 dB mW/g

System Performance Check 750MHz Body 100mW

System Performance Check at 1750 MHz Head TSL

DUT: Dipole 1750 MHz; Type: D1750V2; Serial: 1075

Date/Time: 07/03/2017 10:44:14 AM

Communication System: DuiJiangJi; Frequency: 1750 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 1750$ MHz; $\sigma = 1.34$ S/m; $\epsilon_r = 40.9$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

Probe: ES3DV3 - SN3292; ConvF(5.54, 5.54, 5.54); Calibrated: 09/02/2016;

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1315; Calibrated: 07/26/2016

Phantom: SAM 1; Type: SAM;

Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

System Performance Check at 1750MHz/Area Scan (61x111x1): Interpolated grid: dx=1.50 mm, dy=1.50 mm

Maximum value of SAR (interpolated) = 4.22 mW/g

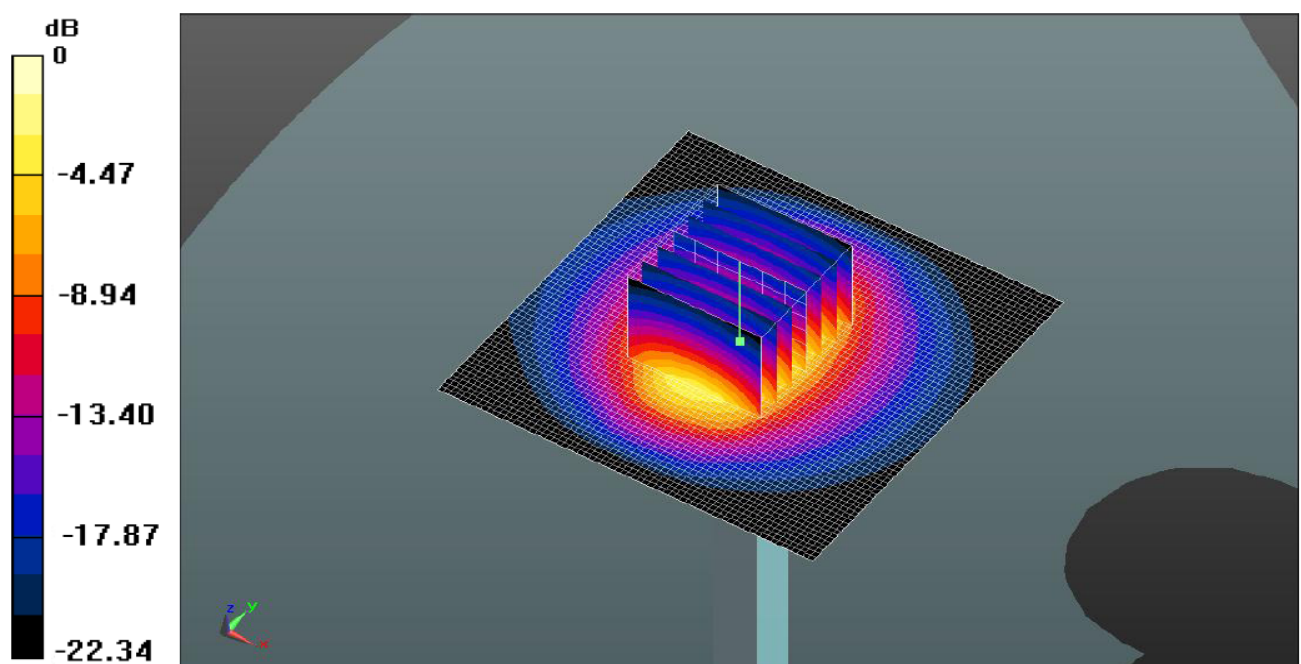
System Performance Check at 1750MHz/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 55.641 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 4.78 mW/g

SAR(1 g) = 3.56 mW/g; SAR(10 g) = 1.98 mW/g

Maximum value of SAR (measured) = 4.16 mW/g



0 dB = 4.16 mW/g = 6.19 dB mW/g

System Performance Check at 1750 MHz Body TSL

DUT: Dipole 1750 MHz; Type: D1750V2; Serial: 1075

Date/Time: 07/04/2017 08:12:27 AM

Communication System: DuiJiangJi; Frequency: 1750 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 1750$ MHz; $\sigma = 1.45$ S/m; $\epsilon_r = 52.8$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

Probe: ES3DV3 - SN3292; ConvF(5.28, 5.28, 5.28); Calibrated: 09/02/2016;

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1315; Calibrated: 07/26/2016

Phantom: ELI 4.0; Type: QDOVA001BA;

Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

System Performance Check at 1750MHz/Area Scan (61x111x1): Interpolated grid: dx=1.50 mm, dy=1.50 mm

Maximum value of SAR (interpolated) = 4.57 mW/g

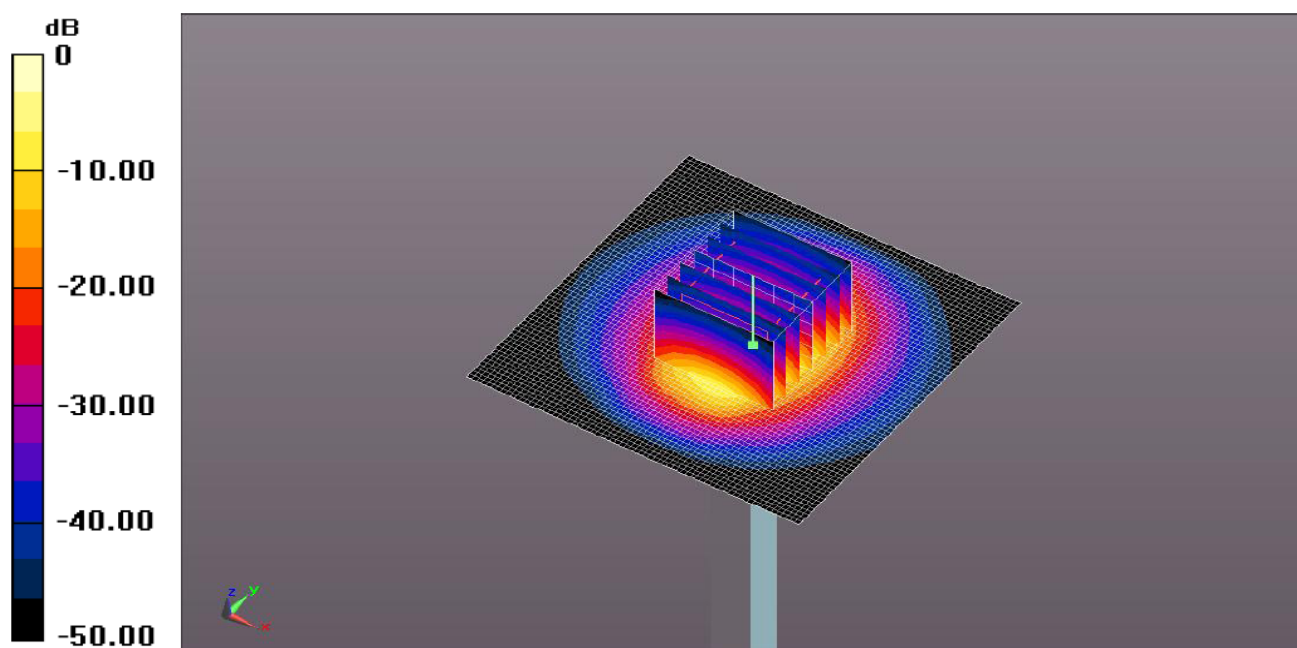
System Performance Check at 1900MHz/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 56.322 V/m; Power Drift = 0.06 dB

Peak SAR (extrapolated) = 5.93 mW/g

SAR(1 g) = 3.68 mW/g; SAR(10 g) = 1.71 mW/g

Maximum value of SAR (measured) = 4.44 mW/g



0 dB = 4.44 mW/g = 6.47 dB mW/g

System Performance Check 1750MHz Body 100mW

5.12. SAR Test Graph Results

SAR plots for **the highest measured SAR** in each exposure configuration, wireless mode and frequency band combination according to FCC KDB 865664 D02.

Head GSM850, Right Cheek, Middle Channel, 836.60 MHz

Communication System: DuiJiangJi; Frequency: 836.60 MHz; Duty Cycle: 1:2

Medium parameters used (interpolated): $f = 837$ MHz; $\sigma = 0.91$ S/m; $\epsilon_r = 41.9$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

Probe: ES3DV3 - SN3292; ConvF(6.53, 6.53, 6.53); Calibrated: 09/02/2016;

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1315; Calibrated: 07/26/2016

Phantom: SAM 1; Type: SAM;

Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

Right Check 836.60 MHz/Area Scan (81x161x1): Interpolated grid: $dx=1.50$ mm, $dy=1.50$ mm

Maximum value of SAR (interpolated) = 0.449 mW/g

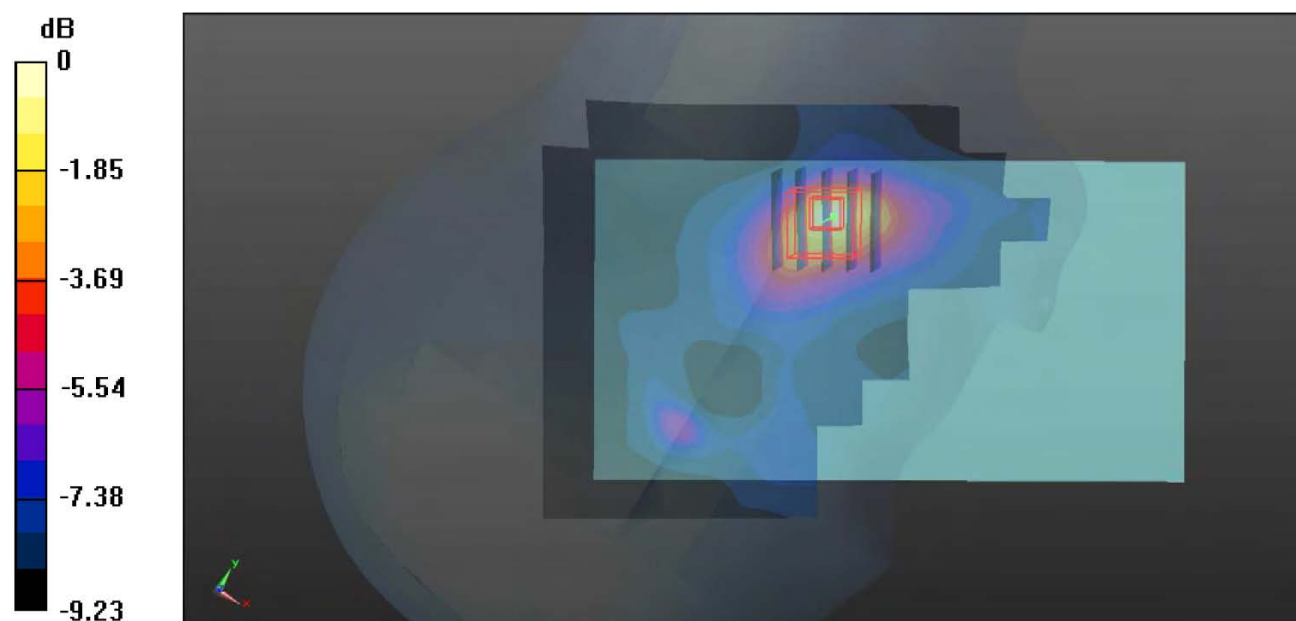
Right Check 836.60 MHz /Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8$ mm, $dy=8$ mm, $dz=5$ mm

Reference Value = 7.166 V/m; Power Drift = -0.14 dB

Peak SAR (extrapolated) = 0.480 mW/g

SAR(1 g) = 0.342 mW/g; SAR(10 g) = 0.277 mW/g

Maximum value of SAR (measured) = 0.426 mW/g



0 dB = 0.426 mW/g = -3.71 dB mW/g

Date/Time: 06/26/2017 11:44:26 AM

Figure 1: Head GSM850, Right Check, Middle Channel, 836.60 MHz

Body- Worn GSM850, Test Position 1, GPRS <4TX Slot>, Middle Channel, 836.60 MHz

Communication System: DuiJiangJi; Frequency: 836.60 MHz; Duty Cycle: 1:2.67

Medium parameters used (interpolated): $f = 837$ MHz; $\sigma = 0.95$ S/m; $\epsilon_r = 54.4$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

Probe: ES3DV3 - SN3292; ConvF(6.27, 6.27, 6.27); Calibrated: 09/02/2016;

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1315; Calibrated: 07/26/2016

Phantom: ELI 4.0; Type: QDOVA001BA;

Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

Test Position 1 836.60 MHz/Area Scan (81x161x1): Interpolated grid: dx=1.50 mm, dy=1.50 mm

Maximum value of SAR (interpolated) = 0.981 mW/g

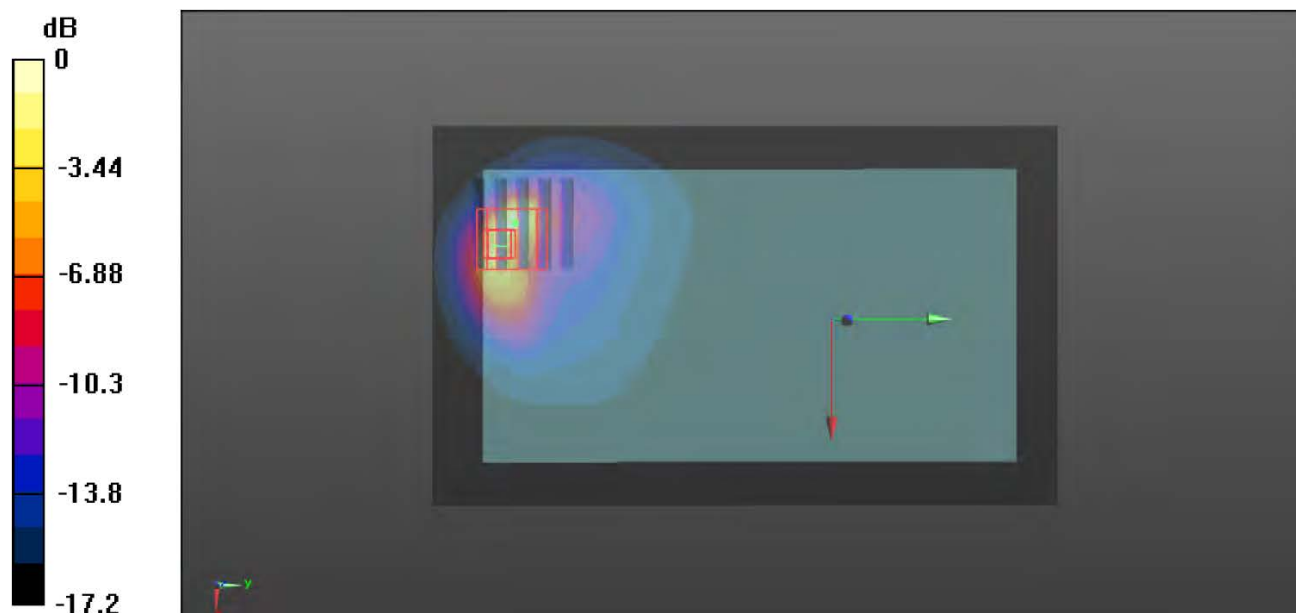
Test Position 1 836.60 MHz /Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 31.037 V/m; Power Drift = - 0.01 dB

Peak SAR (extrapolated) = 1.06 mW/g

SAR(1 g) = 0.936 mW/g; SAR(10 g) = 0.704 mW/g

Maximum value of SAR (measured) = 0.966 mW/g



0 dB = 0.966 mW/g = -0.21 dB mW/g

Date/Time: 06/27/2017 15:24:17 PM

Figure 2: Body- Worn GSM850, Test Position 1, GPRS<4TX Slot>, 836.60 MHz

Head GSM1900, Right Cheek, Middle Channel, 1880.0 MHz

Communication System: DuiJiangJi; Frequency: 1880.0 MHz; Duty Cycle: 1:2

Medium parameters used (interpolated): $f = 1880$ MHz; $\sigma = 1.44$ S/m; $\epsilon_r = 41.1$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

Probe: ES3DV3 - SN3292; ConvF(5.26, 5.26, 5.26); Calibrated: 09/02/2016;

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1315; Calibrated: 07/26/2016

Phantom: SAM 1; Type: SAM;

Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

Right Check 1880.0 MHz/Area Scan (81x161x1): Interpolated grid: $dx=1.50$ mm, $dy=1.50$ mm

Maximum value of SAR (interpolated) = 0.378 mW/g

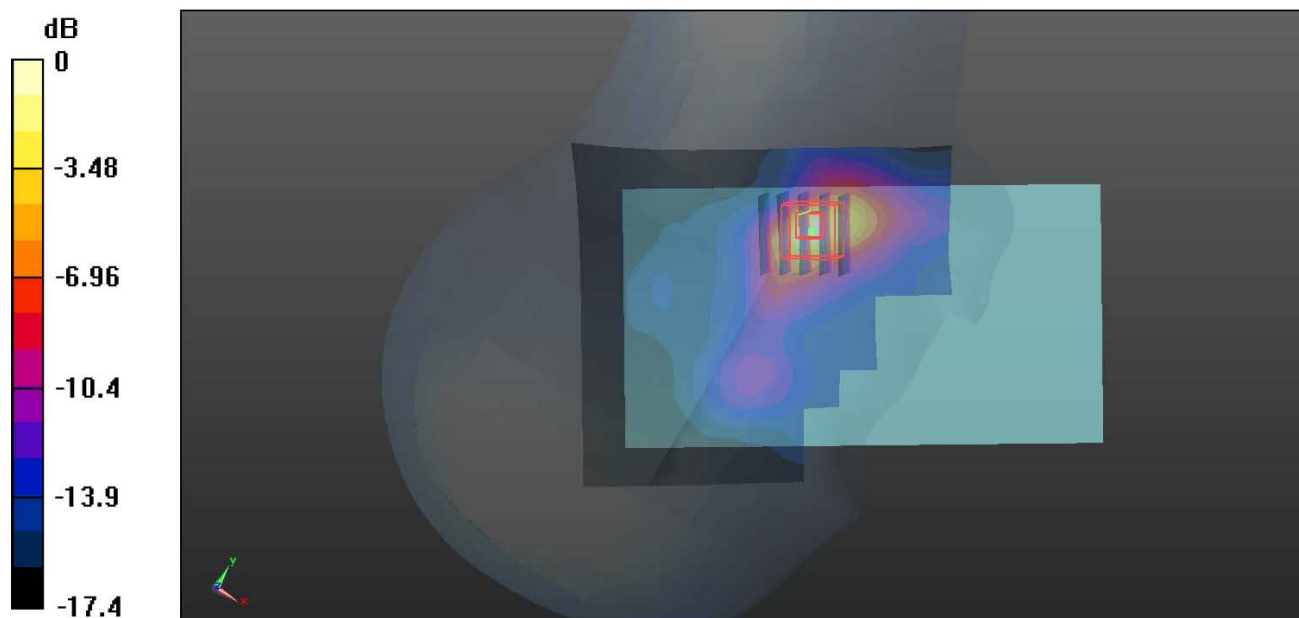
Right Check 1880.0 MHz /Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8$ mm, $dy=8$ mm, $dz=5$ mm

Reference Value = 3.292 V/m; Power Drift = -0.18 dB

Peak SAR (extrapolated) = 0.422 mW/g

SAR(1 g) = 0.253 mW/g; SAR(10 g) = 0.149 mW/g

Maximum value of SAR (measured) = 0.312 mW/g



0 dB = 0.312 mW/g = -5.06 dB mW/g

Date/Time: 06/26/2017 20:22:01 PM

Figure 3: Head GSM1900, Right Check, Middle Channel, 1880.0 MHz

Body- Worn GSM1900, Test Position 1, GPRS <4TX Slot>, Middle Channel, 1880.0 MHz

Communication System: DuiJiangJi; Frequency: 1880.0 MHz; Duty Cycle: 1:2

Medium parameters used (interpolated): $f = 1880$ MHz; $\sigma = 1.51$ S/m; $\epsilon_r = 54.5$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

Probe: ES3DV3 - SN3292; ConvF(5.05, 5.05, 5.05); Calibrated: 09/02/2016;

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1315; Calibrated: 07/26/2016

Phantom: ELI 4.0; Type: QDOVA001BA;

Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

Test Position 1 1880.0 MHz/Area Scan (81x161x1): Interpolated grid: $dx=1.50$ mm, $dy=1.50$ mm

Maximum value of SAR (interpolated) = 0.802 mW/g

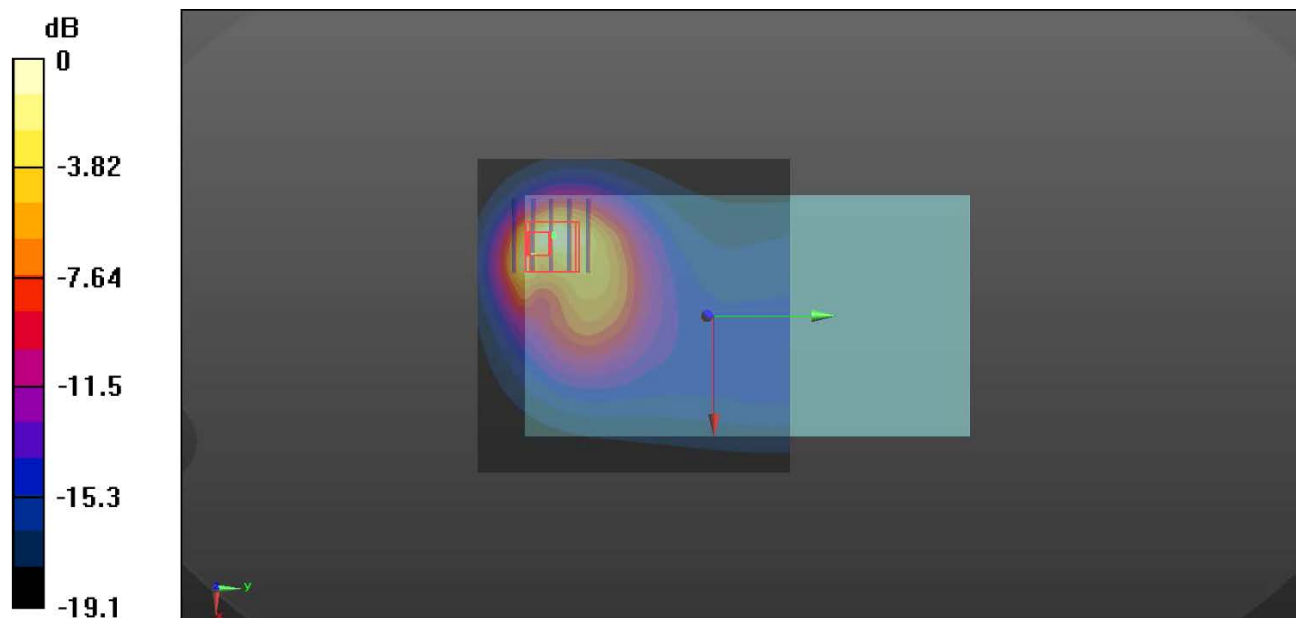
Test Position 1 1880.0 MHz /Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8$ mm, $dy=8$ mm, $dz=5$ mm

Reference Value = 5.846 V/m; Power Drift = -0.13 dB

Peak SAR (extrapolated) = 0.929 mW/g

SAR(1 g) = 0.736 mW/g; SAR(10 g) = 0.411 mW/g

Maximum value of SAR (measured) = 0.845 mW/g



0 dB = 0.845 mW/g = -0.73 dB mW/g

Date/Time: 06/29/2017 11:01:34 AM

Figure 4: Body- Worn GSM1900, Test Position 1, GPRS<4TX Slot>, 1880.0 MHz

Head UMTS Band V, Right Cheek, High Channel, 836.60 MHz

Communication System: DuiJiangJi; Frequency: 846.60 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 847$ MHz; $\sigma = 0.92$ S/m; $\epsilon_r = 42.5$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

Probe: ES3DV3 - SN3292; ConvF(6.53, 6.53, 6.53); Calibrated: 09/02/2016;

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1315; Calibrated: 07/26/2016

Phantom: SAM 1; Type: SAM;

Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

Right Check 846.60 MHz/Area Scan (81x161x1): Interpolated grid: $dx=1.50$ mm, $dy=1.50$ mm

Maximum value of SAR (interpolated) = 0.359 mW/g

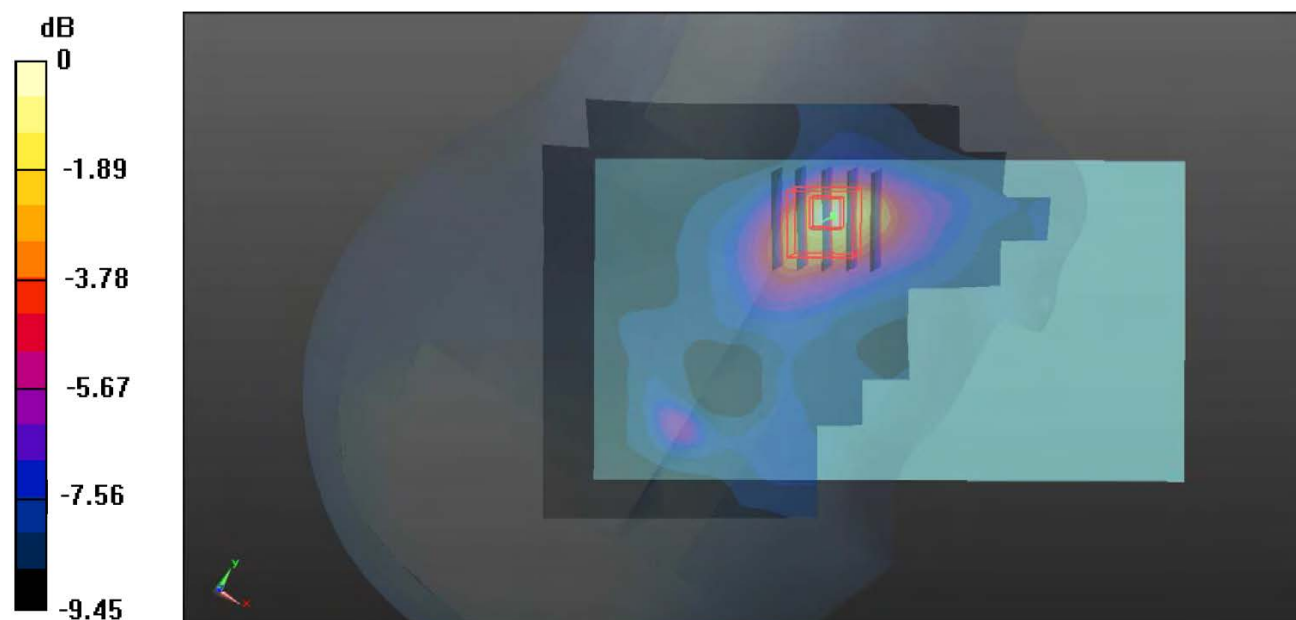
Right Check 846.60 MHz /Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8$ mm, $dy=5$ mm, $dz=5$ mm

Reference Value = 6.234 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 0.429 mW/g

SAR(1 g) = 0.298 mW/g; SAR(10 g) = 0.183 mW/g

Maximum value of SAR (measured) = 0.331 mW/g



0 dB = 0.331 mW/g = -4.81 dB mW/g

Date/Time: 06/26/2017 13:52:14 PM

Figure 5: Head UMTS Band V, Right Check, High Channel, 846.60 MHz

Body- Worn UMTS Band V, Test Position 1, High Channel, 846.60 MHz

Communication System: DuiJiangJi; Frequency: 846.60 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 847$ MHz; $\sigma = 0.96$ S/m; $\epsilon_r = 54.9$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

Probe: ES3DV3 - SN3292; ConvF(6.27, 6.27, 6.27); Calibrated: 09/02/2016;

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1315; Calibrated: 07/26/2016

Phantom: ELI 4.0; Type: QDOVA001BA;

Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

Test Position 1 846.60 MHz/Area Scan (81x161x1): Interpolated grid: dx=1.50 mm, dy=1.50 mm

Maximum value of SAR (interpolated) = 0.818 mW/g

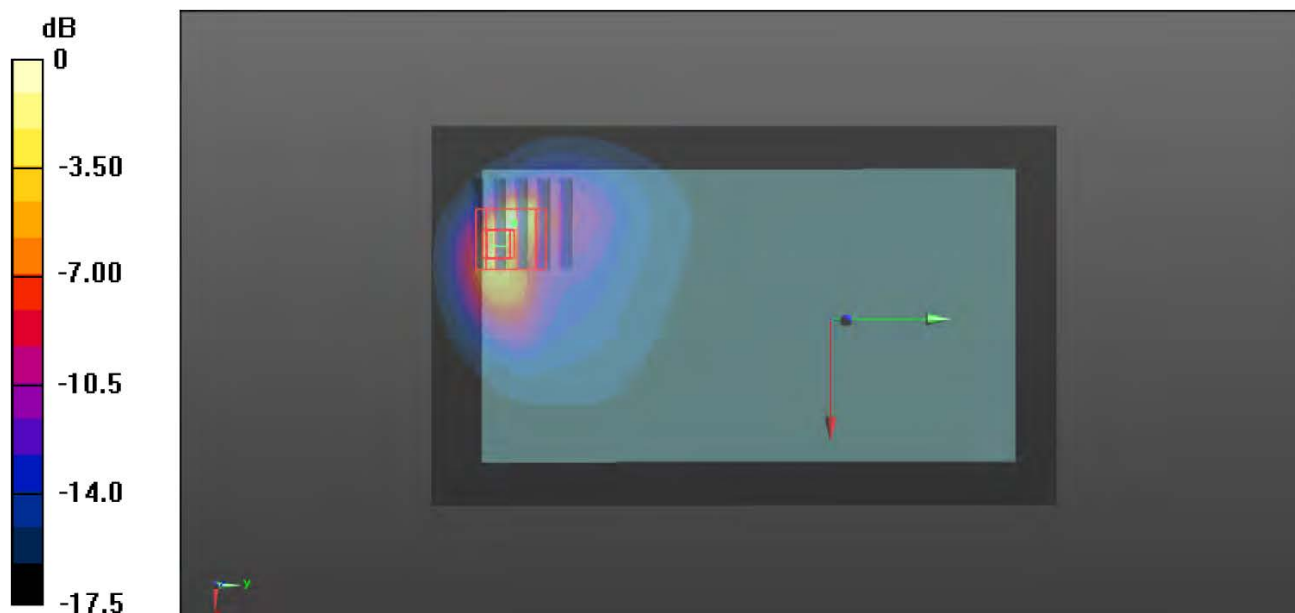
Test Position 1 846.60 MHz /Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 27.544 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 1.10 mW/g

SAR(1 g) = 0.772 mW/g; SAR(10 g) = 0.578 mW/g

Maximum value of SAR (measured) = 0.888 mW/g



0 dB = 0.888 mW/g = -0.52 dB mW/g

Date/Time: 06/27/2017 18:36:22 PM

Figure 6: Body- Worn UMTS Band V, Test Position 1, 846.60 MHz

Head UMTS Band IV, Right Cheek, High Channel, 1752.6 MHz

Communication System: DuiJiangJi; Frequency: 1752.6 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 1753$ MHz; $\sigma = 1.34$ S/m; $\epsilon_r = 40.9$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

Probe: ES3DV3 - SN3292; ConvF(5.54, 5.54, 5.54); Calibrated: 09/02/2016;

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1315; Calibrated: 07/26/2016

Phantom: SAM 1; Type: SAM;

Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

Right Check 1752.6 MHz/Area Scan (81x161x1): Interpolated grid: $dx=1.50$ mm, $dy=1.50$ mm

Maximum value of SAR (interpolated) = 0.422 mW/g

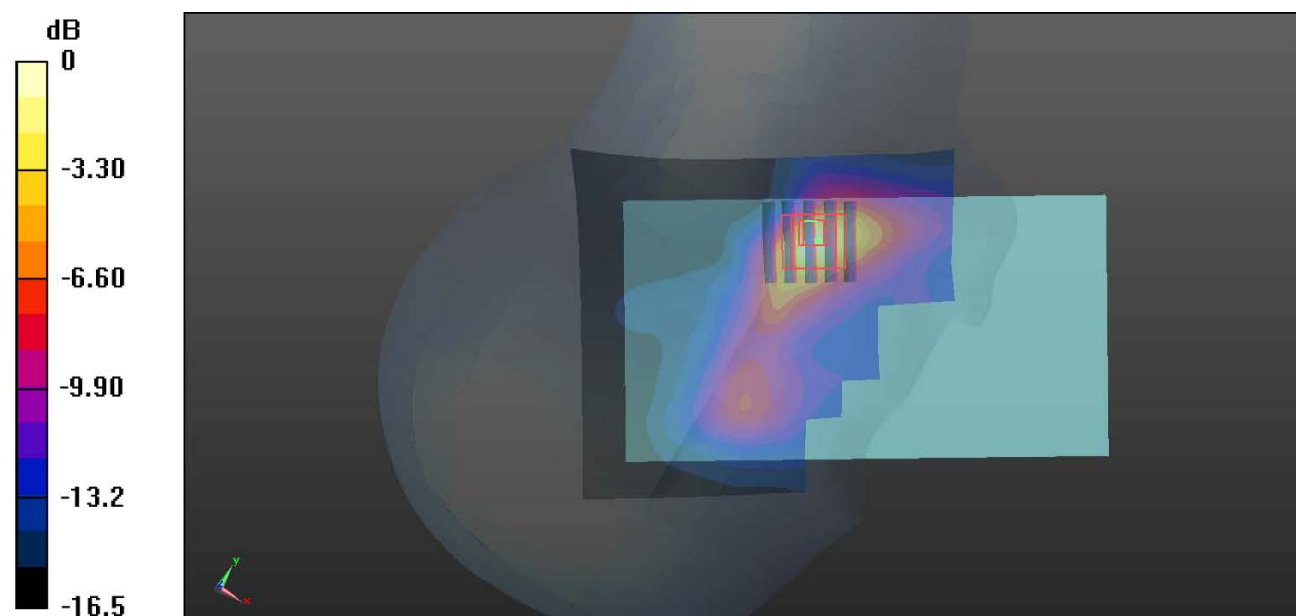
Right Check 1752.6 MHz /Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8$ mm, $dy=8$ mm, $dz=5$ mm

Reference Value = 13.912 V/m; Power Drift = 0.17 dB

Peak SAR (extrapolated) = 0.483 mW/g

SAR(1 g) = 0.258 mW/g; SAR(10 g) = 0.152 mW/g

Maximum value of SAR (measured) = 0.327 mW/g



0 dB = 0.327 mW/g = -4.85 dB mW/g

Date/Time: 07/03/2017 12:34:01 PM

Figure 7: Head UMTS Band IV, Right Check, High Channel, 1752.6 MHz

Body- Worn UMTS Band IV, Test Position 1, High Channel, 1752.6 MHz

Communication System: DuiJiangJi; Frequency: 1752.6 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 1753$ MHz; $\sigma = 1.45$ S/m; $\epsilon_r = 52.8$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

Probe: ES3DV3 - SN3292; ConvF(5.28, 5.28, 5.28); Calibrated: 09/02/2016;

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1315; Calibrated: 07/26/2016

Phantom: ELI 4.0; Type: QDOVA001BA;

Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

Test Position 1 1752.6 MHz/Area Scan (81x161x1): Interpolated grid: $dx=1.50$ mm, $dy=1.50$ mm

Maximum value of SAR (interpolated) = 0.812 mW/g

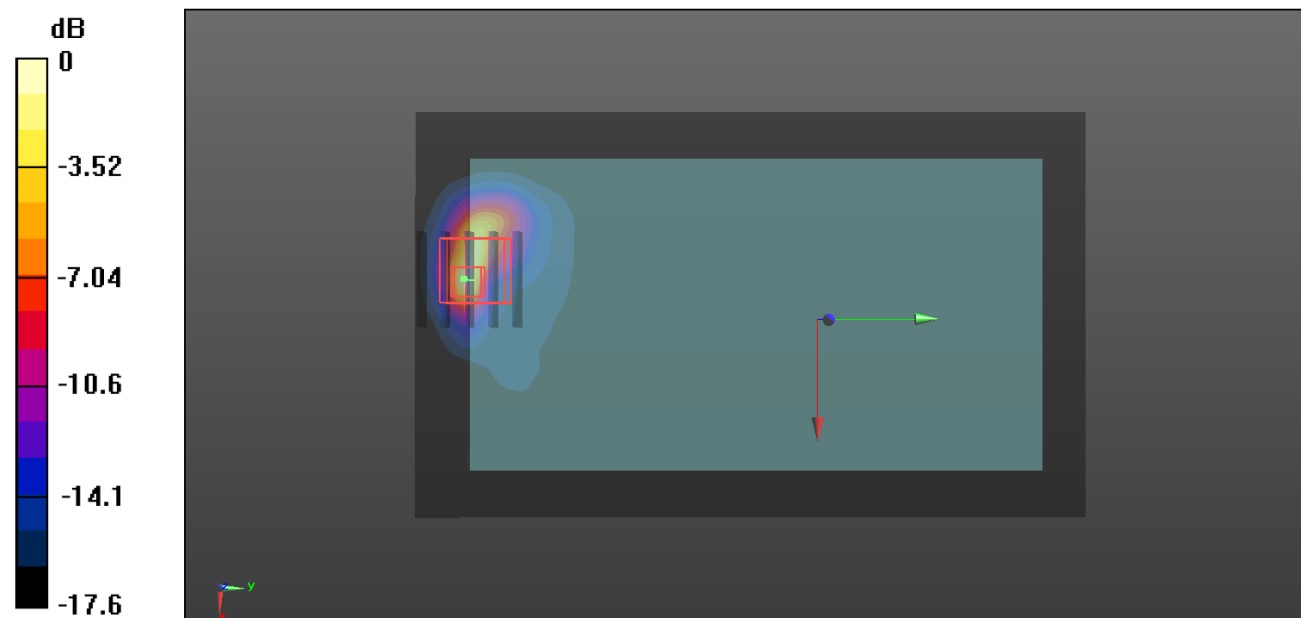
Test Position 1 1752.6 MHz /Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8$ mm, $dy=8$ mm, $dz=5$ mm

Reference Value = 8.577 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 0.794 mW/g

SAR(1 g) = 0.770 mW/g; SAR(10 g) = 0.477 mW/g

Maximum value of SAR (measured) = 0.864 mW/g



0 dB = 0.864 mW/g = -0.63 dB mW/g

Date/Time: 07/04/2017 09:39:52 AM

Figure 8: Body- Worn UMTS Band IV, Test Position 1, 1752.6 MHz

Head LTE Band 2 <1RB>, Right Cheek, Low Channel, 1860.0 MHz

Communication System: DuiJiangJi; Frequency: 1860.0 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 1860$ MHz; $\sigma = 1.44$ S/m; $\epsilon_r = 41.8$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

Probe: ES3DV3 - SN3292; ConvF(5.26, 5.26, 5.26); Calibrated: 09/02/2016;

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1315; Calibrated: 07/26/2016

Phantom: SAM 1; Type: SAM;

Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

Right Check 1860.0 MHz/Area Scan (81x161x1): Interpolated grid: $dx=1.50$ mm, $dy=1.50$ mm

Maximum value of SAR (interpolated) = 0.262 mW/g

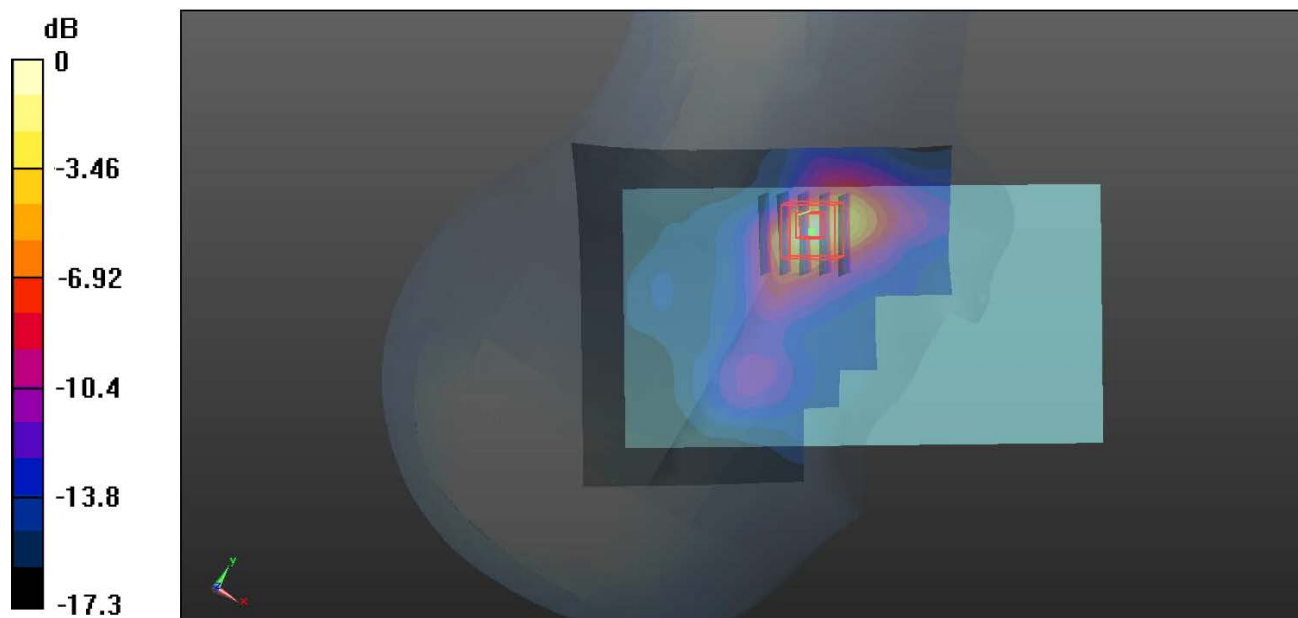
Right Check 1860.0 MHz /Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8$ mm, $dy=8$ mm, $dz=5$ mm

Reference Value = 2.891 V/m; Power Drift = 0.18 dB

Peak SAR (extrapolated) = 0.254 mW/g

SAR(1 g) = 0.147 mW/g; SAR(10 g) = 0.095 mW/g

Maximum value of SAR (measured) = 0.196 mW/g



0 dB = 0.196 mW/g = -7.08 dB mW/g

Date/Time: 06/26/2017 22:55:14 PM

Figure 9: Head LTE Band 2 <1RB>, Right Check, Low Channel, 1860.0 MHz

Body- Worn LTE Band 2 <1RB>, Test Position 1, Low Channel, 1860.0 MHz

Communication System: DuiJiangJi; Frequency: 1860.0 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 1860$ MHz; $\sigma = 1.51$ S/m; $\epsilon_r = 55.2$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

Probe: ES3DV3 - SN3292; ConvF(5.05, 5.05, 5.05); Calibrated: 09/02/2016;

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1315; Calibrated: 07/26/2016

Phantom: ELI 4.0; Type: QDOVA001BA;

Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

Test Position 1 1860.0 MHz/Area Scan (81x161x1): Interpolated grid: dx=1.50 mm, dy=1.50 mm

Maximum value of SAR (interpolated) = 0.853 mW/g

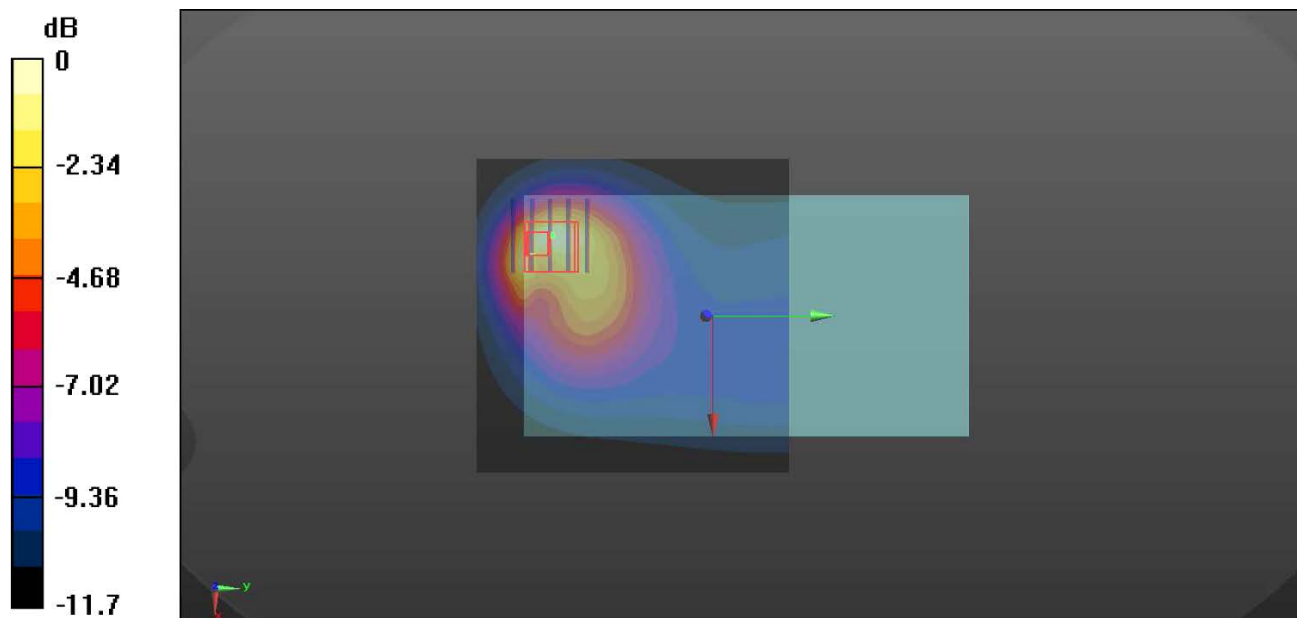
Test Position 1 1860.0 MHz /Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 5.866 V/m; Power Drift = -0.12 dB

Peak SAR (extrapolated) = 1.23 mW/g

SAR(1 g) = 0.772 mW/g; SAR(10 g) = 0.495 mW/g

Maximum value of SAR (measured) = 0.800 mW/g



0 dB = 0.800 mW/g = -0.97 dB mW/g

Date/Time: 06/29/2017 15:24:11 PM

Figure 10: Body- Worn LTE Band 2 <1RB>, Test Position 1, 1860.0 MHz

Head LTE Band 4 <1RB>, Right Cheek, Low Channel, 1720.0 MHz

Communication System: DuiJiangJi; Frequency: 1720.0 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 1720$ MHz; $\sigma = 1.35$ S/m; $\epsilon_r = 41.6$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

Probe: ES3DV3 - SN3292; ConvF(5.54, 5.54, 5.54); Calibrated: 09/02/2016;

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1315; Calibrated: 07/26/2016

Phantom: SAM 1; Type: SAM;

Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

Right Check 1720.0 MHz/Area Scan (81x161x1): Interpolated grid: $dx=1.50$ mm, $dy=1.50$ mm

Maximum value of SAR (interpolated) = 0.412 mW/g

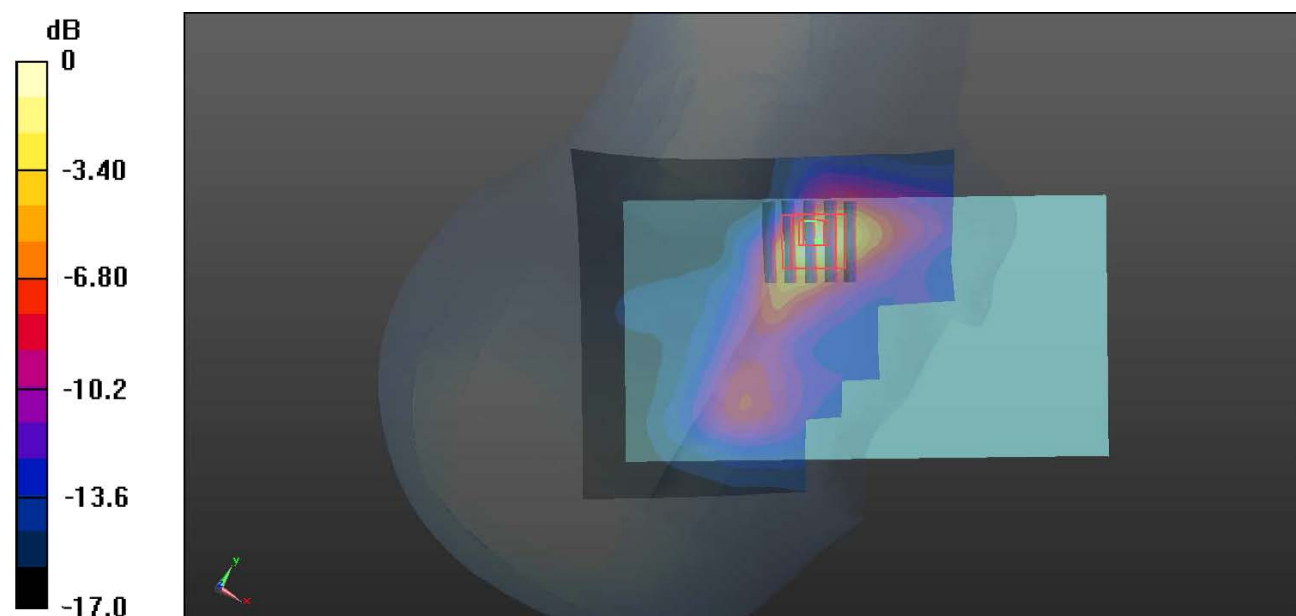
Right Check 1720.0 MHz /Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8$ mm, $dy=8$ mm, $dz=5$ mm

Reference Value = 13.712 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 0.442 mW/g

SAR(1 g) = 0.237 mW/g; SAR(10 g) = 0.149 mW/g

Maximum value of SAR (measured) = 0.312 mW/g



0 dB = 0.312 mW/g = -5.06 dB mW/g

Date/Time: 07/03/2017 14:01:26 PM

Figure 11: Head LTE Band 4 <1RB>, Right Check, Low Channel, 1720.0 MHz

Body- Worn LTE Band 4 <1RB>, Test Position 1, Low Channel, 1720.0 MHz

Communication System: DuiJiangJi; Frequency: 1720.0 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 1720$ MHz; $\sigma = 1.44$ S/m; $\epsilon_r = 53.4$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

Probe: ES3DV3 - SN3292; ConvF(5.28, 5.28, 5.28); Calibrated: 09/02/2016;

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1315; Calibrated: 07/26/2016

Phantom: ELI 4.0; Type: QDOVA001BA;

Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

Test Position 1 1720.0 MHz/Area Scan (81x161x1): Interpolated grid: dx=1.50 mm, dy=1.50 mm

Maximum value of SAR (interpolated) = 0.812 mW/g

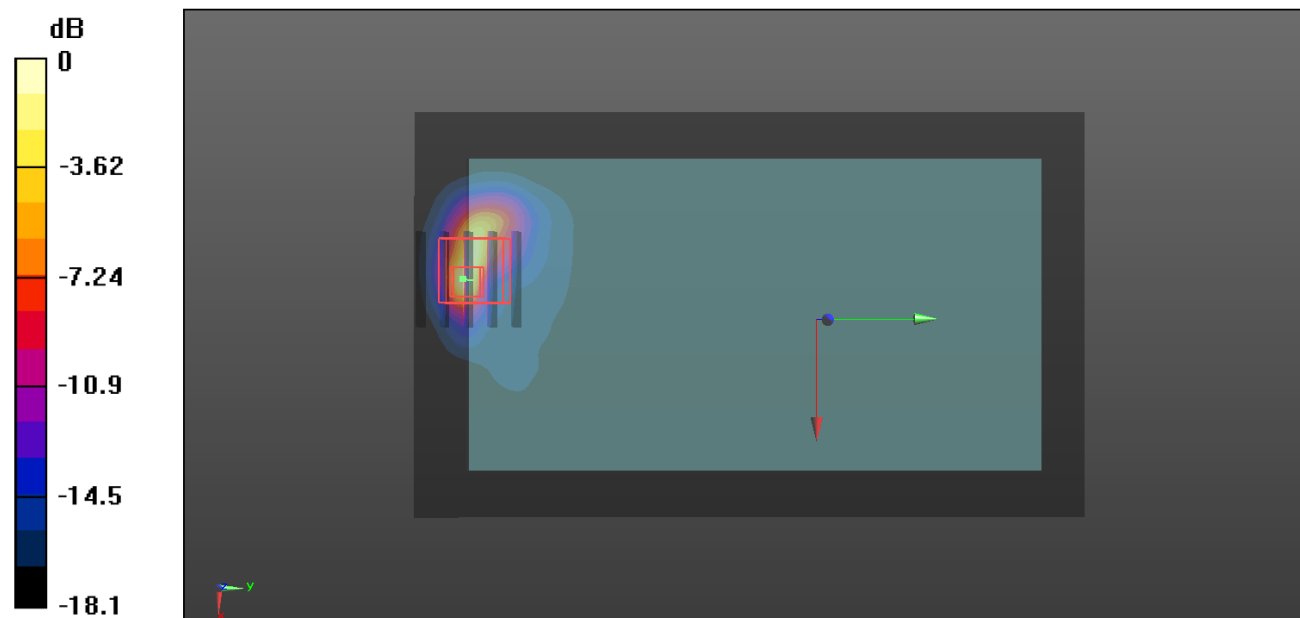
Test Position 1 1720.0 MHz /Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 8.534 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 0.887 mW/g

SAR(1 g) = 0.717 mW/g; SAR(10 g) = 0.472 mW/g

Maximum value of SAR (measured) = 0.829 mW/g



0 dB = 0.829 mW/g = -0.81 dB mW/g

Date/Time: 07/04/2017 15:24:19 PM

Figure 12: Body- Worn LTE Band 4 <1RB>, Test Position 1, 1720.0 MHz

Head LTE Band 12 <1RB>, Right Cheek, Middle Channel, 707.5 MHz

Communication System: DuiJiangJi; Frequency: 707.5 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 708$ MHz; $\sigma = 0.89$ S/m; $\epsilon_r = 42.7$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

Probe: ES3DV3 - SN3292; ConvF(6.76, 6.76, 6.76); Calibrated: 09/02/2016;

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1315; Calibrated: 07/26/2016

Phantom: SAM 1; Type: SAM;

Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

Right Check 707.50 MHz/Area Scan (81x161x1): Interpolated grid: $dx=1.50$ mm, $dy=1.50$ mm

Maximum value of SAR (interpolated) = 0.516 mW/g

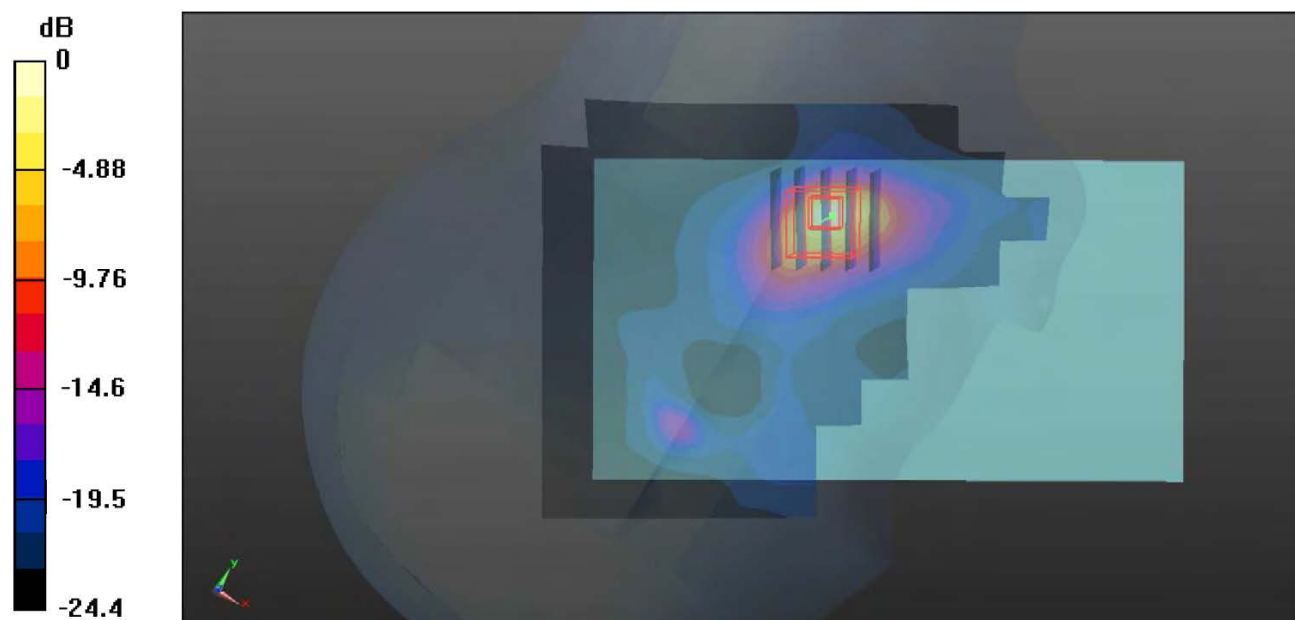
Right Check 707.50 MHz /Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8$ mm, $dy=8$ mm, $dz=5$ mm

Reference Value = 9.261 V/m; Power Drift = 0.11 dB

Peak SAR (extrapolated) = 0.477 mW/g

SAR(1 g) = 0.344 mW/g; SAR(10 g) = 0.278 mW/g

Maximum value of SAR (measured) = 0.412 mW/g



0 dB = 0.412 mW/g = -3.85 dB mW/g

Date/Time: 07/02/2017 11:44:26 AM

Figure 13: Head LTE Band 12 <1RB>, Right Check, Middle Channel, 707.50 MHz

Body- Worn LTE Band 12 <1RB>, Test Position 1, Middle Channel, 707.50 MHz

Communication System: DuiJiangJi; Frequency: 707.50 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 708$ MHz; $\sigma = 0.96$ S/m; $\epsilon_r = 57.3$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

Probe: ES3DV3 - SN3292; ConvF(6.25, 6.25, 6.25); Calibrated: 09/02/2016;

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1315; Calibrated: 07/26/2016

Phantom: ELI 4.0; Type: QDOVA001BA;

Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

Test Position 1 707.50 MHz/Area Scan (81x161x1): Interpolated grid: dx=1.50 mm, dy=1.50 mm

Maximum value of SAR (interpolated) = 1.14 mW/g

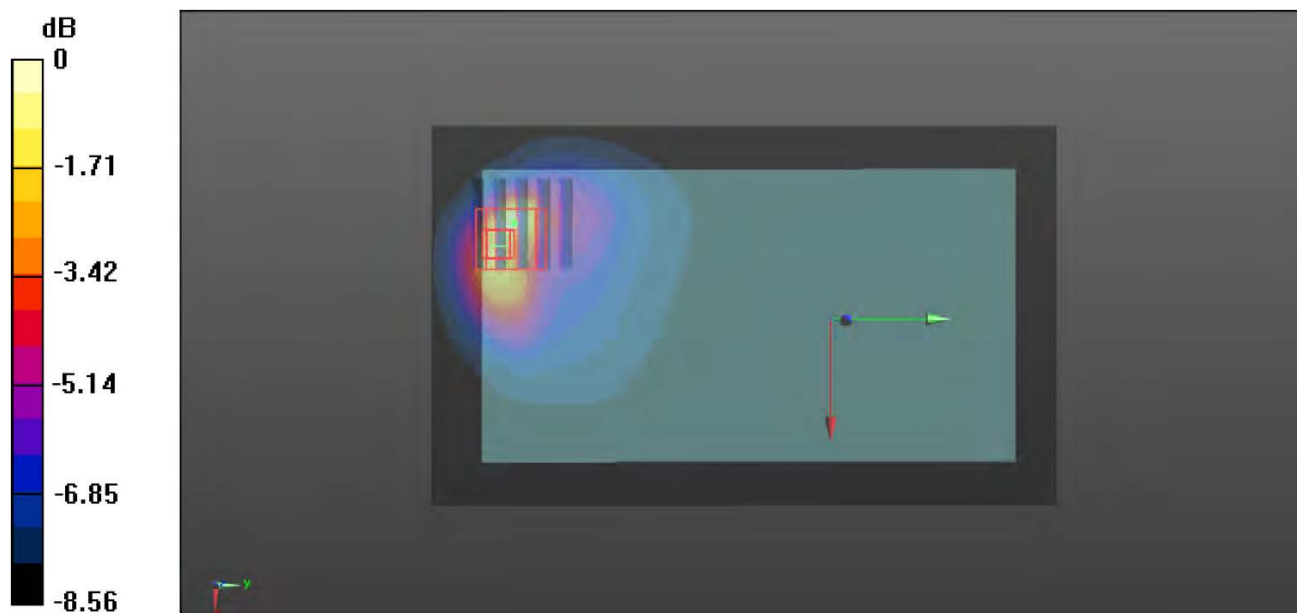
Test Position 1 707.50 MHz /Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 42.347 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 1.38 mW/g

SAR(1 g) = 0.974 mW/g; SAR(10 g) = 0.719 mW/g

Maximum value of SAR (measured) = 1.08 mW/g



0 dB = 1.08 mW/g = 0.33 dB mW/g

Date/Time: 07/02/2017 18:22:06 PM

Figure 14: Body- Worn LTE Band 12 <1RB>, Test Position 1, 707.50 MHz

Head 2.4GWLAN, Right Check, IEEE 802.11b, High Channel 2462 MHz

Communication System: DuiJiangJi; Frequency: 2462 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 2462$ MHz; $\sigma = 1.83$ S/m; $\epsilon_r = 39.9$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

Probe: ES3DV3 - SN3292; ConvF(4.97, 4.97, 4.97); Calibrated: 09/02/2016;

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1315; Calibrated: 07/26/2016

Phantom: SAM 1; Type: SAM;

Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

Right Check 2462 MHz / Area Scan (81x161x1): Interpolated grid: $dx=1.50$ mm, $dy=1.50$ mm

Maximum value of SAR (interpolated) = 0.708 mW/g

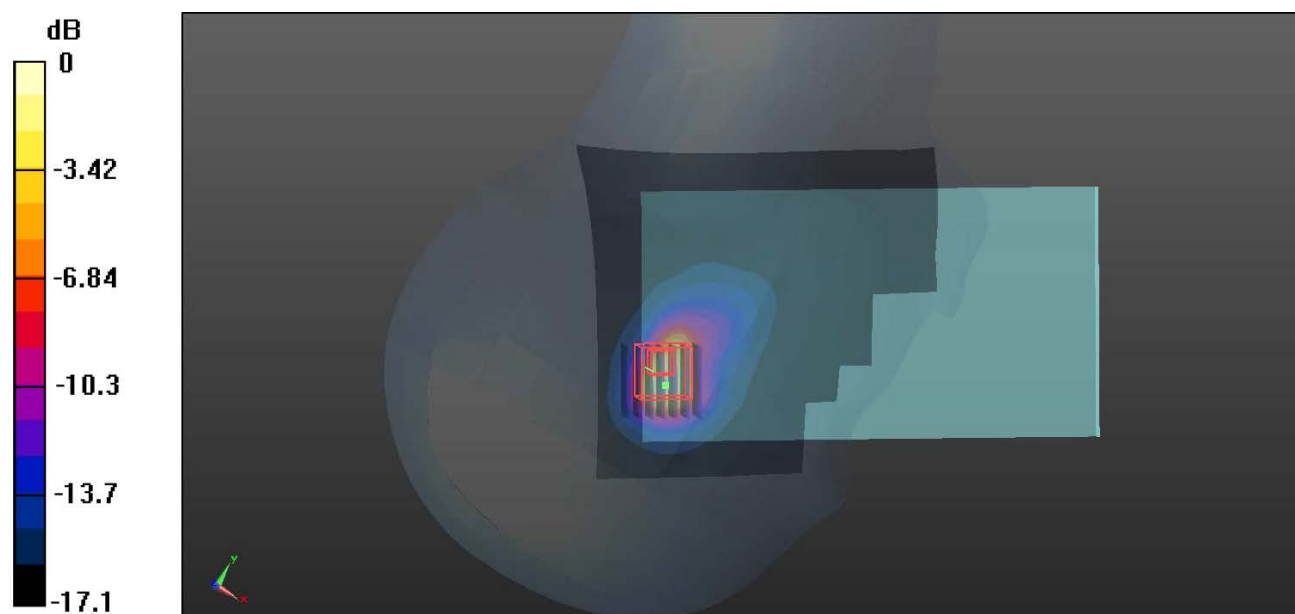
Right Check 2462 MHz / Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8$ mm, $dy=8$ mm, $dz=5$ mm

Reference Value = 10.262 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 0.987 mW/g

SAR(1 g) = 0.644 mW/g; SAR(10 g) = 0.456 mW/g

Maximum value of SAR (measured) = 0.757 mW/g



0 dB = 0.757 mW/g = -1.21 dB mW/g

Date/Time: 06/26/2017 23:27:24 PM

Figure 15: Head 2.4GWLAN, Right Check, IEEE 802.11b, 2462 MHz

Body- Worn 2.4GWLAN, Test Position 1, IEEE 802.11b, High Channel 2462 MHz

Communication System: DuiJiangJi; Frequency: 2462 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 2462$ MHz; $\sigma = 1.96$ S/m; $\epsilon_r = 54.0$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

Probe: ES3DV3 - SN3292; ConvF(4.70, 4.70, 4.70); Calibrated: 09/02/2016;

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1315; Calibrated: 07/26/2016

Phantom: ELI 4.0; Type: QDOVA001BA;

Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

Test Position 1 2462 MHz / Area Scan (81x161x1): Interpolated grid: dx=1.50 mm, dy=1.50 mm

Maximum value of SAR (interpolated) = 0.578 mW/g

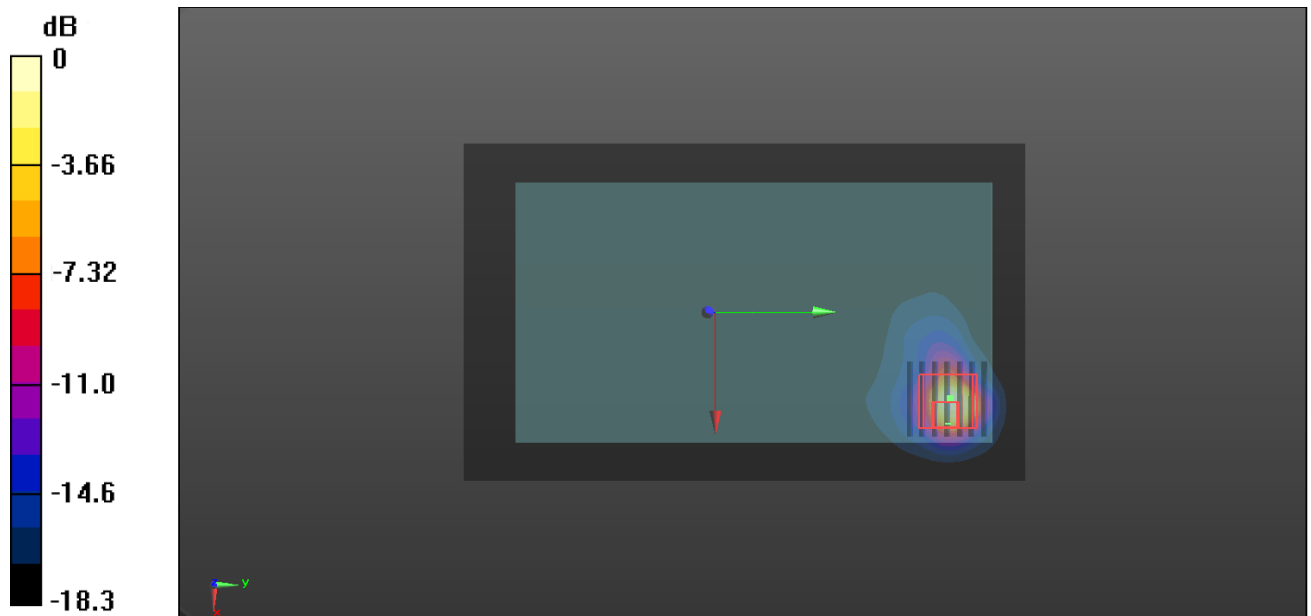
Test Position 1 2462 MHz / Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 13.266 V/m; Power Drift = 0.14 dB

Peak SAR (extrapolated) = 0.814 mW/g

SAR(1 g) = 0.497 mW/g; SAR(10 g) = 0.375 mW/g

Maximum value of SAR (measured) = 0.586 mW/g



0 dB = 0.586 mW/g = -2.32 dB mW/g

Date/Time: 07/01/2017 12:34:52 PM

Figure 16: Body- Worn 2.4GWLAN, Test Position 1, IEEE 802.11b, 2462 MHz

6. Calibration Certificate

6.1. Probe Calibration Certificate

**Calibration Laboratory of
Schmid & Partner
Engineering AG**
Zeughausstrasse 43, 8004 Zurich, Switzerland



S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **CIQ-SZ (Auden)**

Certificate No: **ES3-3292_Sep16**

CALIBRATION CERTIFICATE

Object

ES3DV3 - SN:3292

Calibration procedure(s)

QA CAL-01.v9, QA CAL-12.v9, QA CAL-23.v5, QA CAL-25.v6
Calibration procedure for dosimetric E-field probes

Calibration date:

September 2, 2016

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature $(22 \pm 3)^\circ\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	06-Apr-16 (No. 217-02288/02289)	Apr-17
Power sensor NRP-Z91	SN: 103244	06-Apr-16 (No. 217-02288)	Apr-17
Power sensor NRP-Z91	SN: 103245	06-Apr-16 (No. 217-02289)	Apr-17
Reference 20 dB Attenuator	SN: S5277 (20x)	05-Apr-16 (No. 217-02293)	Apr-17
Reference Probe ES3DV2	SN: 3013	31-Dec-15 (No. ES3-3013_Dec15)	Dec-16
DAE4	SN: 660	23-Dec-15 (No. DAE4-660_Dec15)	Dec-16
Secondary Standards	ID	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB41293874	06-Apr-16 (in house check Jun-16)	In house check: Jun-18
Power sensor E4412A	SN: MY41498087	06-Apr-16 (in house check Jun-16)	In house check: Jun-18
Power sensor E4412A	SN: 000110210	06-Apr-16 (in house check Jun-16)	In house check: Jun-18
RF generator HP 8648C	SN: US3642U01700	04-Aug-99 (in house check Jun-16)	In house check: Jun-18
Network Analyzer HP 8753E	SN: US37390585	18-Oct-01 (in house check Oct-15)	In house check: Oct-16

	Name	Function	Signature
Calibrated by:	Michael Weber	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	
Issued: September 2, 2016			
This calibration certificate shall not be reproduced except in full without written approval of the laboratory.			

**Calibration Laboratory of
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Glossary:

TSL	tissue simulating liquid
NORM _{x,y,z}	sensitivity in free space
ConvF	sensitivity in TSL / NORM _{x,y,z}
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C, D	modulation dependent linearization parameters
Polarization ϕ	ϕ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\vartheta = 0$ is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
- IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Methods Applied and Interpretation of Parameters:

- NORM_{x,y,z}**: Assessed for E-field polarization $\vartheta = 0$ ($f \leq 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). NORM_{x,y,z} are only intermediate values, i.e., the uncertainties of NORM_{x,y,z} does not affect the E^2 -field uncertainty inside TSL (see below ConvF).
- NORM(f)_{x,y,z}** = NORM_{x,y,z} * frequency_response (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of ConvF.
- DCP_{x,y,z}**: DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- PAR**: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- A_{x,y,z}; B_{x,y,z}; C_{x,y,z}; D_{x,y,z}; VR_{x,y,z}**: A, B, C, D are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- ConvF and Boundary Effect Parameters**: Assessed in flat phantom using E-field (or Temperature Transfer Standard for $f \leq 800$ MHz) and inside waveguide using analytical field distributions based on power measurements for $f > 800$ MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORM_{x,y,z} * ConvF whereby the uncertainty corresponds to that given for ConvF. A frequency dependent ConvF is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- Spherical isotropy (3D deviation from isotropy)**: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- Sensor Offset**: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- Connector Angle**: The angle is assessed using the information gained by determining the NORM_x (no uncertainty required).

ES3DV3 – SN:3292

September 2, 2016

Probe ES3DV3

SN:3292

Manufactured:	July 6, 2010
Repaired:	August 29, 2016
Calibrated:	September 2, 2016

Calibrated for DASY/EASY Systems
(Note: non-compatible with DASY2 system!)

ES3DV3– SN:3292

September 2, 2016

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3292**Basic Calibration Parameters**

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu\text{V}/(\text{V}/\text{m})^2$) ^A	0.94	0.95	0.93	± 10.1 %
DCP (mV) ^B	105.7	101.2	111.7	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB $\sqrt{\mu\text{V}}$	C	D dB	VR mV	Unc ^E (k=2)
0	CW	X	0.0	0.0	1.0	0.00	205.6	±3.5 %
		Y	0.0	0.0	1.0		212.6	
		Z	0.0	0.0	1.0		204.7	

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

^A The uncertainties of Norm X,Y,Z do not affect the E²-field uncertainty inside TSL (see Pages 5 and 6).

^B Numerical linearization parameter: uncertainty not required.

^E Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

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DASY/EASY - Parameters of Probe: ES3DV3 - SN:3292

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) ^C	Relative Permittivity ^F	Conductivity (S/m) ^F	ConvF X	ConvF Y	ConvF Z	Alpha ^G	Depth ^G (mm)	Unc (k=2)
450	43.5	0.87	7.12	7.12	7.12	0.20	1.30	± 13.3 %
750	41.9	0.89	6.76	6.76	6.76	0.80	1.19	± 12.0 %
835	41.5	0.90	6.53	6.53	6.53	0.43	1.64	± 12.0 %
900	41.5	0.97	6.40	6.40	6.40	0.53	1.43	± 12.0 %
1750	40.1	1.37	5.54	5.54	5.54	0.80	1.15	± 12.0 %
1900	40.0	1.40	5.26	5.26	5.26	0.55	1.47	± 12.0 %
2450	39.2	1.80	4.97	4.97	4.97	0.64	1.41	± 12.0 %
2600	39.0	1.96	4.77	4.77	4.77	0.80	1.28	± 12.0 %

^C Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

^F At frequencies below 3 GHz, the validity of tissue parameters (ϵ and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ϵ and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

^G Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe diameter from the boundary.

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DASY/EASY - Parameters of Probe: ES3DV3 - SN:3292

Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) ^C	Relative Permittivity ^F	Conductivity (S/m) ^F	ConvF X	ConvF Y	ConvF Z	Alpha ^G	Depth ^G (mm)	Unc (k=2)
450	56.7	0.94	7.33	7.33	7.33	0.13	1.50	± 13.3 %
750	55.5	0.96	6.25	6.25	6.25	0.38	1.66	± 12.0 %
835	55.2	0.97	6.27	6.27	6.27	0.47	1.56	± 12.0 %
900	55.0	1.05	6.16	6.16	6.16	0.80	1.15	± 12.0 %
1750	53.4	1.49	5.28	5.28	5.28	0.70	1.36	± 12.0 %
1900	53.3	1.52	5.05	5.05	5.05	0.64	1.44	± 12.0 %
2450	52.7	1.95	4.70	4.70	4.70	0.74	1.22	± 12.0 %
2600	52.5	2.16	4.52	4.52	4.52	0.80	1.13	± 12.0 %

^C Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

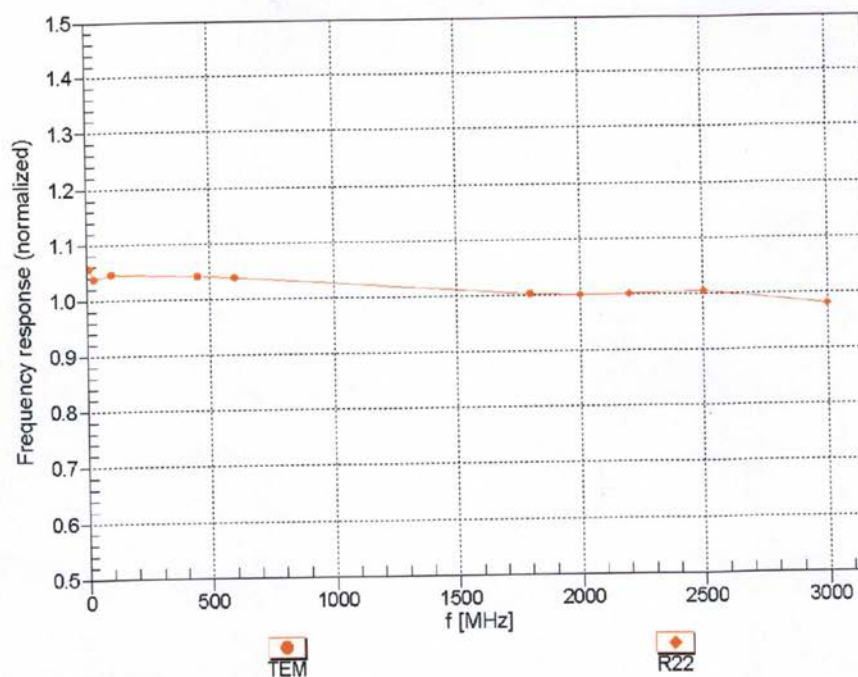
^F At frequencies below 3 GHz, the validity of tissue parameters (ϵ and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ϵ and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

^G Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

ES3DV3- SN:3292

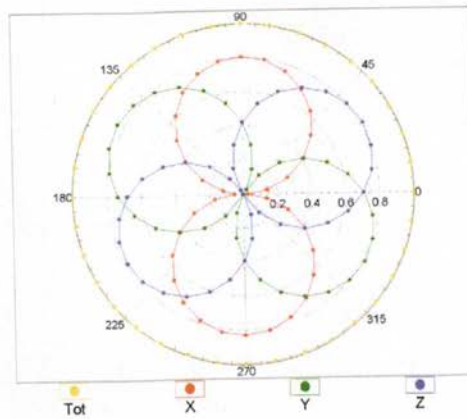
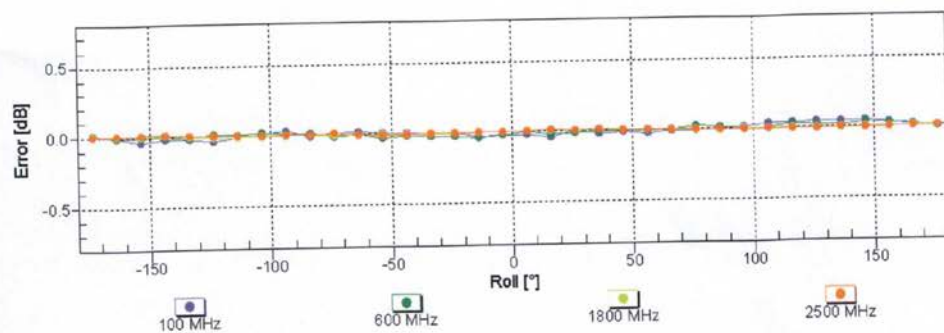
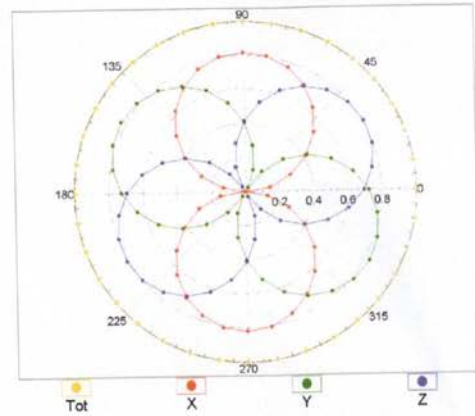
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Frequency Response of E-Field (TEM-Cell:ifi110 EXX, Waveguide: R22)

Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ ($k=2$)

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Receiving Pattern (ϕ), $\theta = 0^\circ$ **f=600 MHz,TEM****f=1800 MHz,R22****Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)**