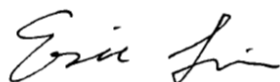


FCC SAR TEST REPORT

Application No.: KSCR2110000181AT(SZCR2110023370AT)
FCC ID: 2AOJNGBS-2104-G
Applicant: Zhongshan Transtek Electronics Co.,Ltd
Address of Applicant: No. 23,Jin'an Road, Minzhong, Zhongshan ,Guangdong, China
Manufacturer: Zhongshan Transtek Electronics Co.,Ltd
Address of Manufacturer: No. 23,Jin'an Road, Minzhong, Zhongshan ,Guangdong, China
Factory: Zhongshan Transtek Electronics Co.,Ltd
Address of Factory: No. 23,Jin'an Road, Minzhong, Zhongshan ,Guangdong, China
Product Name: Cellular Body Scale
Model No.(EUT): GBS-2104-G
Trade mark: N/A
Standard(s) : FCC 47CFR §2.1093
Date of Receipt: 2021-10-25
Date of Test: 2021-11-29 to 2021-12-03
Date of Issue: 2021-12-06

Test Result:	Pass*
---------------------	--------------

* In the configuration tested, the EUT complied with the standards specified above.



Eric Lin

Laboratory Manager



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REVISION HISTORY

Revision Record			
Version	Description	Date	Remark
00	Original	2021-12-06	/

Authorized for issue by:				
				
		Richard.Kong/ Project Engineer		
				
		Eric.Lin/Reviewer		



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TEST SUMMARY

Frequency Band	Maximum Reported SAR(W/kg)	SAR Limited(W/kg) 10-g
	Extremity	
GSM 850	0.60	4.0
PCS 1900	1.33	4.0
LTE CatM1 Band 2	0.19	4.0
LTE CatM1 Band 4	0.21	4.0
LTE CatM1 Band 12	0.53	4.0
LTE CatM1 Band 13	0.59	4.0
LTE CatM1 Band 25	0.21	4.0



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1 General Information

1.1 General Description of EUT

Device Type :	Portable device		
Exposure Category:	Uncontrolled environment / General population		
Product Phase:	Production unit		
IMEI:	867420041930134		
Hardware Version:	TSH2104 20211210		
Software Version:	A6		
Antenna Type:	PIFA Antenna		
Antenna Gain:	GSM 850: 0.5dBi (Provided by Manufacturer) PCS 1900: 3.5dBi (Provided by Manufacturer) LTE CatM1 Band 2: 3.5dBi (Provided by Manufacturer) LTE CatM1 Band 4: 3.1dBi (Provided by Manufacturer) LTE CatM1 Band 12: 1.3dBi (Provided by Manufacturer) LTE CatM1 Band 13: 1.1dBi (Provided by Manufacturer) LTE CatM1 Band 25: 3.5dBi (Provided by Manufacturer)		
Device Operating Configurations :			
Modulation Mode:	WIFI: CCK, DSSS, OFDM		
Frequency Bands:	Band	Tx (MHz)	Rx (MHz)
	GSM 850	824~849	869~894
	PCS 1900	1850~1910	1930~1989
	LTE CatM1 Band 2	1850~1910	1930~1990
	LTE CatM1 Band 4	1710~1755	2110~2155
	LTE CatM1 Band 12	699~716	729~746
	LTE CatM1 Band 13	777~787	746~756
	LTE CatM1 Band 25	1850~1915	1930~1995
Power supplier:	4*AA LR6 1.5V		



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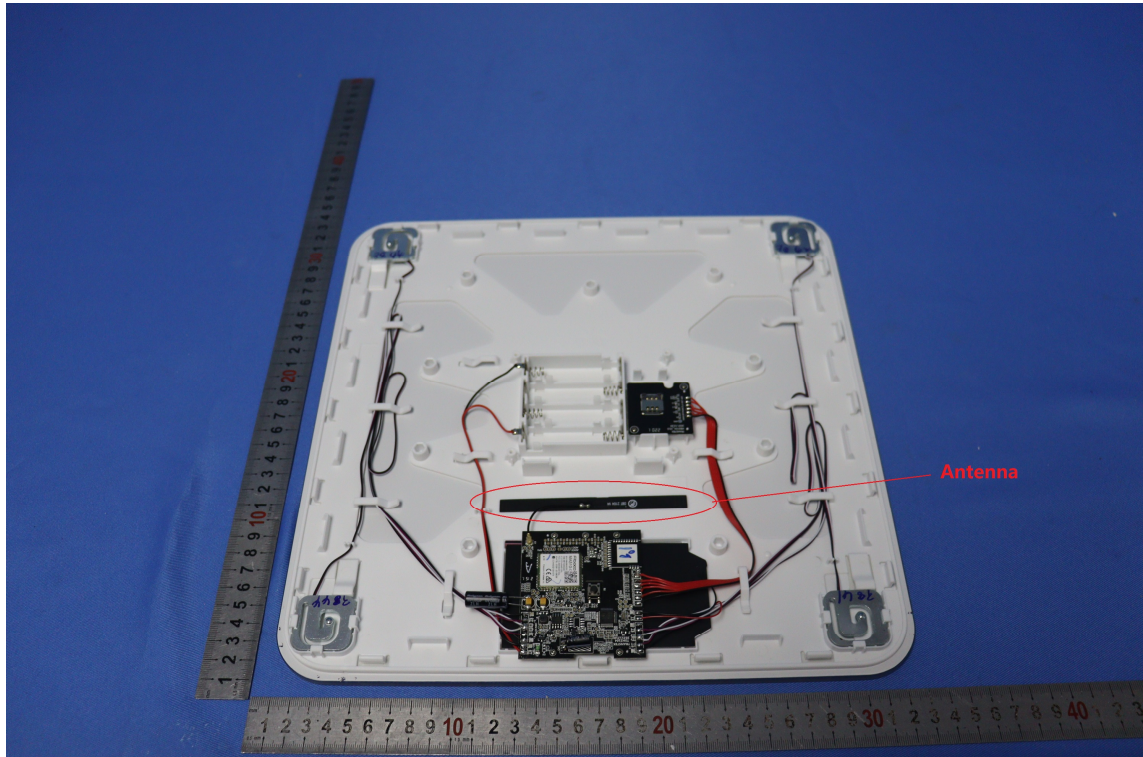
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1.2 DUT Antenna Locations(Front View)



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1.3 Test Specification

Identity	Document Title
FCC 47CFR §2.1093	Radio frequency Radiation Exposure Evaluation: Portable Devices
IEEE Std C95.1 – 2019	IEEE Standard for Safety Levels with Respect to Human Exposure to Electric, Magnetic, and Electromagnetic Fields, 0 Hz to 300 GHz
IEEE 1528-2013	Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques
KDB447498 D01 General RF Exposure Guidance v06	Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies
KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04	SAR Measurement Requirements for 100 MHz to 6 GHz
KDB 865664 D02 RF Exposure Reporting v01r02	RF Exposure Compliance Reporting and Documentation Considerations
KDB 941225 D05 v02r05	SAR EVALUATION CONSIDERATIONS FOR LTE DEVICES



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1.4 RF exposure limits

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

Notes:

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

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

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

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

Controlled Environments are defined as locations where there is exposure that may be incurred by persons who are aware of the potential for exposure, (i.e. as a result of employment or occupation.)



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1.5 Test Location

Company: Compliance Certification Services (Kunshan) Inc.
Address: No.10 Weiye Rd., Innovation park, Eco&Tec, Development Zone, Kunshan City, Jiangsu, China
Post code: 215300
Telephone: 86-512-57355888
Fax: 86-512-57370818

1.6 Test Facility

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

- **CNAS (No. CNAS L4354)**

CNAS has accredited Compliance Certification Services (Kunshan) Inc. to ISO/IEC 17025:2017 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.

- **A2LA (Certificate No. 2541.01)**

Compliance Certification Services (Kunshan) Inc. is accredited by the American Association for Laboratory Accreditation (A2LA). Certificate No. 2541.01.

- **FCC –Designation Number: CN1172**

Compliance Certification Services (Kunshan) Inc. has been recognized as an accredited testing laboratory. Designation Number: CN1172.

- **ISED (CAB identifier: CN0072)**

Compliance Certification Services (Kunshan) Inc. has been recognized by Innovation, Science and Economic Development Canada (ISED) as an accredited testing laboratory
CAB Identifier: CN0072.

- **VCCI (Member No.: 1938)**

The 3m and 10m Semi-anechoic chamber and Shielded Room of Compliance Certification Services (Kunshan) Inc. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: : R-20134, R-11600, C-11707, T-11499, G-10216 respectively.



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2 Laboratory Environment

Temperature	Min. = 18°C, Max. = 25 °C
Relative humidity	Min. = 30%, Max. = 70%
Ground system resistance	< 0.5 Ω
Ambient noise is checked and found very low and in compliance with requirement of standards. Reflection of surrounding objects is minimized and in compliance with requirement of standards.	

Table 1: The Ambient Conditions



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3 SAR Measurements System Configuration

3.1 The SAR Measurement System

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

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

A standard high precision 6-axis robot (Stabile RX family) with controller, teach pendant and software .An arm extension for accommodation the data acquisition electronics (DAE).

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

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

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



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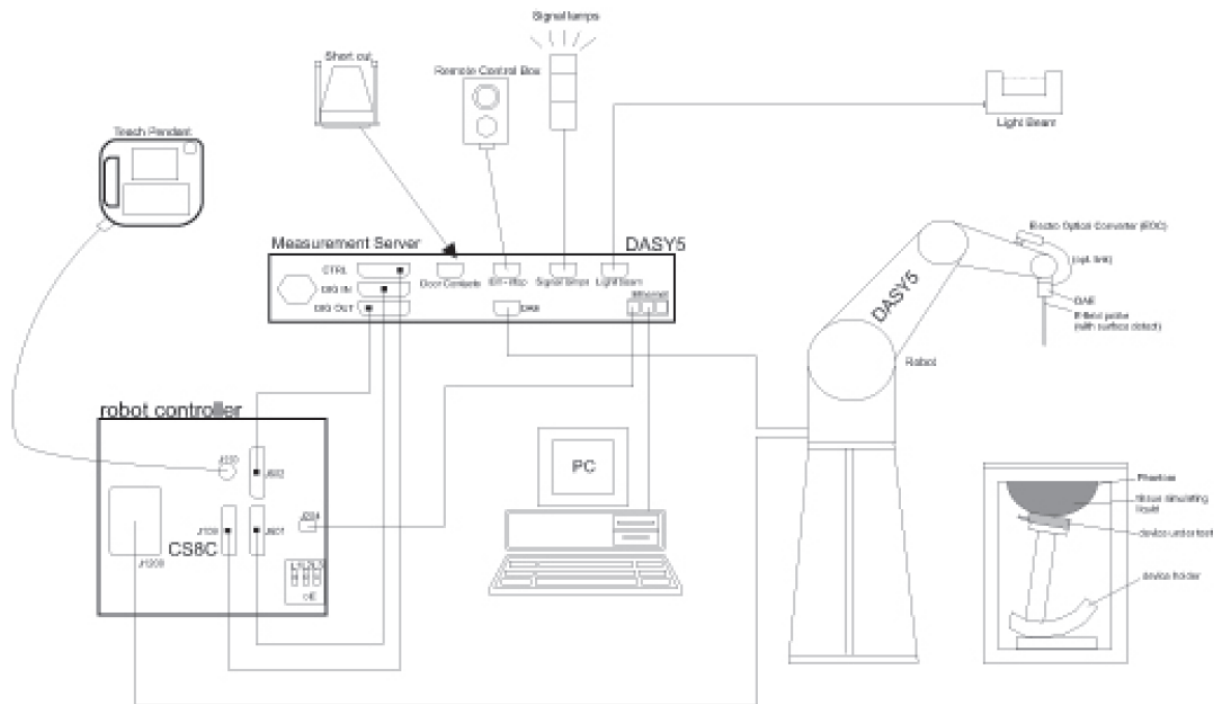
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F-1. SAR Measurement System Configuration

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

3.2 Isotropic E-field Probe EX3DV4



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



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3.3 Data Acquisition Electronics (DAE)

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

3.4 SAM Twin Phantom

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

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

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




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3.5 ELI Phantom

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

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

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



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3.6 Device Holder for Transmitters



F-2. Device Holder for Transmitters

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



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3.7 Measurement procedure

3.7.1 Scanning procedure

Step 1: Power reference measurement

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

Step 2: Area scan

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

Step 3: Zoom scan

Around this point, a volume of 30mm*30mm*30mm (fine resolution volume scan, zoom scan) was assessed by measuring 5x5x7 points ($\leq 2\text{GHz}$) and 7x7x7 points ($\geq 2\text{GHz}$). On this basis of this data set, the spatial peak SAR value was evaluated with the following procedure:

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

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



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	$\leq 3 \text{ GHz}$		$> 3 \text{ GHz}$
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface	$5 \pm 1 \text{ mm}$		$\frac{1}{2} \cdot \delta \cdot \ln(2) \pm 0.5 \text{ mm}$
Maximum probe angle from probe axis to phantom surface normal at the measurement location	$30^\circ \pm 1^\circ$		$20^\circ \pm 1^\circ$
Maximum area scan spatial resolution: $\Delta x_{\text{Area}}, \Delta y_{\text{Area}}$	$\leq 2 \text{ GHz}: \leq 15 \text{ mm}$ $2 - 3 \text{ GHz}: \leq 12 \text{ mm}$		$3 - 4 \text{ GHz}: \leq 12 \text{ mm}$ $4 - 6 \text{ GHz}: \leq 10 \text{ mm}$
	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 \leq 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: $\Delta x_{\text{Zoom}}, \Delta y_{\text{Zoom}}$	$\leq 2 \text{ GHz}: \leq 8 \text{ mm}$ $2 - 3 \text{ GHz}: \leq 5 \text{ mm}^*$		$3 - 4 \text{ GHz}: \leq 5 \text{ mm}^*$ $4 - 6 \text{ GHz}: \leq 4 \text{ mm}^*$
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{\text{Zoom}}(n)$		$3 - 4 \text{ GHz}: \leq 4 \text{ mm}$ $4 - 5 \text{ GHz}: \leq 3 \text{ mm}$ $5 - 6 \text{ GHz}: \leq 2 \text{ mm}$
	graded grid	$\Delta z_{\text{Zoom}}(1)$: between 1 st two points closest to phantom surface	$3 - 4 \text{ GHz}: \leq 3 \text{ mm}$ $4 - 5 \text{ GHz}: \leq 2.5 \text{ mm}$ $5 - 6 \text{ GHz}: \leq 2 \text{ mm}$
		$\Delta z_{\text{Zoom}}(n>1)$: between subsequent points	$\leq 1.5 \cdot \Delta z_{\text{Zoom}}(n-1)$
Minimum zoom scan volume	x, y, z	$\geq 30 \text{ mm}$	$3 - 4 \text{ GHz}: \geq 28 \text{ mm}$ $4 - 5 \text{ GHz}: \geq 25 \text{ mm}$ $5 - 6 \text{ GHz}: \geq 22 \text{ mm}$
Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details. * When zoom scan is required and the <u>reported</u> SAR from the <u>area scan based 1-g SAR estimation</u> procedures of KDB 447498 is $\leq 1.4 \text{ W/kg}$, $\leq 8 \text{ mm}$, $\leq 7 \text{ mm}$ and $\leq 5 \text{ mm}$ zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.			

Step 4: Power reference measurement (drift)

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



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3.7.2 Data Storage

The DASY software stores the acquired data from the data acquisition electronics as raw data (in microvolt readings from the probe sensors), together with all necessary software parameters for the data evaluation (probe calibration data, liquid parameters and device frequency and modulation data) in measurement files with the extension ".DAE3". The software evaluates the desired unit and format for output each time the data is visualized or exported. This allows verification of the complete software setup even after the measurement and allows correction of incorrect parameter settings. For example, if a measurement has been performed with a wrong crest factor parameter in the device setup, the parameter can be corrected afterwards and the data can be re-evaluated. The measured data can be visualized or exported in different units or formats, depending on the selected probe type ([V/m], [A/m], [°C], [m W/g], [m W/cm²], [dBrel], etc.). Some of these units are not available in certain situations or show meaningless results, e.g., a SAR output in a lossless media will always be zero. Raw data can also be exported to perform the evaluation with other software packages.

3.7.3 Data Evaluation by SEMCAD

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

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

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

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

If the exciting field is pulsed, the crest factor of the signal must be known to correctly compensate for peak power. The formula for each channel can be given as:

$$V_i = U_i + U_i^2 \cdot c f / d c p_i$$

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)



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

E-field probes:

$$E_i = (V_i / \text{Norm}_i \cdot \text{ConvF})^{1/2}$$

H-field probes:

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

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):

$$E_{\text{tot}} = (E_x^2 + E_y^2 + E_z^2)^{1/2}$$

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

$$\text{SAR} = (E_{\text{tot}}^2 \cdot \sigma) / (\epsilon \cdot 1000)$$

With SAR = local specific absorption rate in mW/g

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

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

ϵ = equivalent tissue density in g/cm³

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

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

with P_{pwe} = equivalent power density of a plane wave in mW/cm²

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

H_{tot} = total magnetic field strength in A/m



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4 SAR measurement variability and uncertainty

4.1 SAR measurement variability

Per KDB865664 D01 SAR measurement 100 MHz to 6 GHz v01r04, SAR measurement variability must be assessed for each frequency band, which is determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. The additional measurements are repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device should be returned to ambient conditions (normal room temperature) with the battery fully charged before it is re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

1) Repeated measurement is not required when the original highest measured SAR is < 0.80 W/kg; steps 2) through 4) do not apply.

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

3) Perform a second repeated measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is > 1.20 or when the original or repeated measurement is ≥ 1.45 W/kg ($\sim 10\%$ 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.



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4.2 SAR measurement uncertainty

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



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5 Description of Test Position

5.1 Extremity exposure conditions

Devices that are designed or intended for use on extremities, or mainly operated in extremity only exposure conditions, i.e., hands, wrists, feet and ankles, may require extremity SAR evaluation.

The closest distance from the antenna to an adjacent device surface is used to determine if SAR testing is required for the adjacent surfaces, with the adjacent surface positioned against the phantom and the surface containing the antenna positioned perpendicular to the phantom



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6 SAR System Verification Procedure

6.1 Tissue Simulate Liquid

6.1.1 Recipes for Tissue Simulate Liquid

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

Ingredients (% by weight)	Frequency (MHz)									
	450		835		915		1900		2450	
Tissue Type	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body
Water	38.56	51.16	41.45	52.4	41.05	56.0	54.9	40.4	62.7	73.2
Salt (NaCl)	3.95	1.49	1.45	1.4	1.35	0.76	0.18	0.5	0.5	0.04
Sugar	56.32	46.78	56.0	45.0	56.5	41.76	0.0	58.0	0.0	0.0
HEC	0.98	0.52	1.0	1.0	1.0	1.21	0.0	1.0	0.0	0.0
Bactericide	0.19	0.05	0.1	0.1	0.1	0.27	0.0	0.1	0.0	0.0
Triton X-100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.8	0.0
DGBE	0.0	0.0	0.0	0.0	0.0	0.0	44.92	0.0	0.0	26.7
Dielectric Constant	43.42	58.0	42.54	56.1	42.0	56.8	39.9	54.0	39.8	52.5
Conductivity (S/m)	0.85	0.83	0.91	0.95	1.0	1.07	1.42	1.45	1.88	1.78
HSL5GHz is composed of the following ingredients:										
Water: 50-65%										
Mineral oil: 10-30%										
Emulsifiers: 8-25%										
Sodium salt: 0-1.5%										
MSL5GHz is composed of the following ingredients:										
Water: 64-78%										
Mineral oil: 11-18%										
Emulsifiers: 9-15%										
Sodium salt: 2-3%										

Table 2: Recipe of Tissue Simulate Liquid



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6.1.2 Test Liquids Confirmation

Simulated tissue liquid parameter confirmation

The dielectric parameters were checked prior to assessment using the SPEAG DAK3.5 dielectric probe kit. The dielectric parameters measured are reported in each correspondent section.

IEEE SCC-34/SC-2 P1528 recommended tissue dielectric parameters

The head tissue dielectric parameters recommended by the IEEE SCC-34/SC-2 in P1528 have been incorporated in the following table. These head parameters are derived from planar layer models simulating the highest expected SAR for the dielectric properties and tissue thickness variations in a human head. Other head and body tissue parameters that have not been specified in P1528 are derived from the tissue dielectric parameters computed from the 4-Cole-Cole equations and extrapolated according to the head parameters specified in P1528

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 $\rho = 1000 \text{ kg/m}^3$)



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6.1.3 Measurement for Tissue Simulate Liquid

The dielectric properties for this Tissue Simulate Liquids were measured by using the SPEAG DAK3.5 dielectric probe kit in conjunction with Agilent E5071B Network Analyzer (300 KHz-8500 MHz). The Conductivity (σ) and Permittivity (ρ) are listed in bellow table. For the SAR measurement given in this report. The temperature variation of the Tissue Simulate Liquids was $22\pm 2^\circ\text{C}$.

Tissue Type	Measured Frequency (MHz)	Conductivity (σ)	Permittivity (ϵ_r)	Conductivity Target (σ)	Permittivity Target (ϵ_r)	Delta (σ) (%)	Delta (ϵ_r) (%)	Limit (%)	Liquid Temp. ($^\circ\text{C}$)	Date
750 Head	750	0.879	42.786	0.89	41.90	-1.24	2.11	± 5	22	2021/11/30
835 Head	835	0.905	42.113	0.90	41.50	0.56	1.48	± 5	22	2021/11/29
1800 Head	1800	1.386	40.249	1.40	40.00	-1.00	0.62	± 5	21.9	2021/12/03
1900 Head	1900	1.372	40.640	1.40	40.00	-2.00	1.60	± 5	22.1	2021/12/02

6.2 SAR System Check

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



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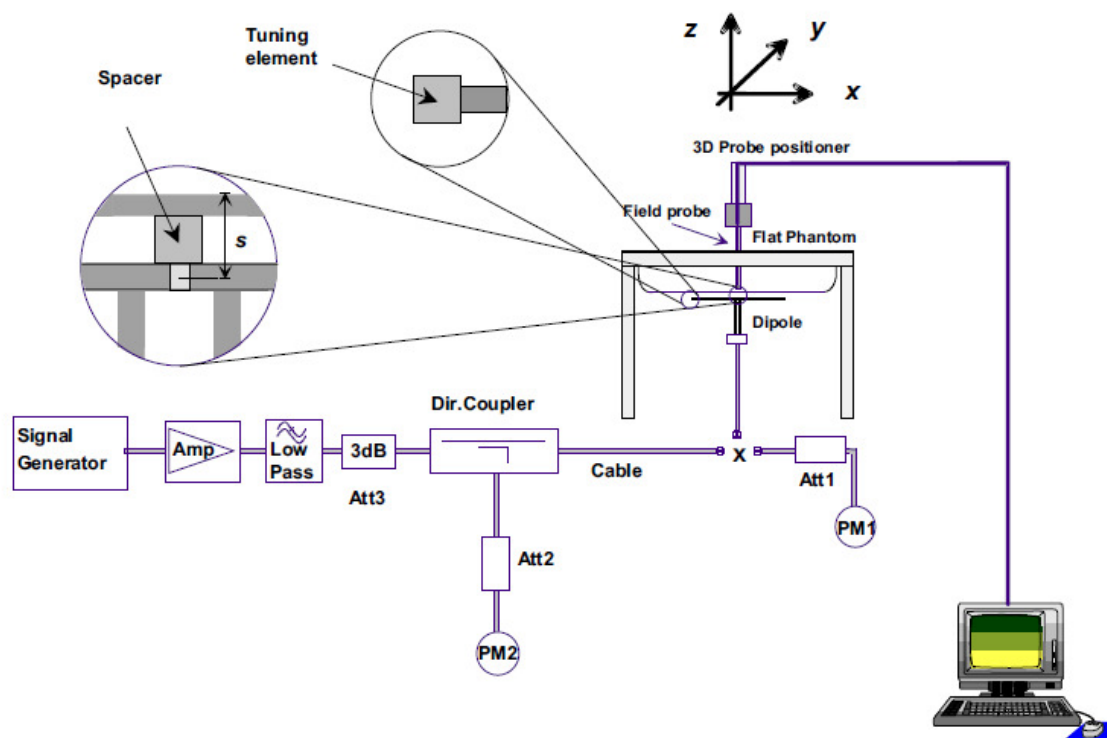
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F-3. the microwave circuit arrangement used for SAR system verification



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6.2.1 Justification for Extended SAR Dipole Calibrations

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

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

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



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6.2.2 Summary System Check Result(s)

Validation Kit		Measured SAR 250mW	Measured SAR 250mW	Measured SAR (normalized to 1w)	Measured SAR (normalized to 1w)	Target SAR (normalized to 1w) (±10%)	Target SAR (normalized to 1w) (±10%)	Liquid Temp. (°C)	Measured Date
		1g (W/kg)	10g (W/kg)	1g (W/kg)	10g (W/kg)	1-g(W/kg)	10-g(W/kg)		
D750V3	Head	1.92	1.28	7.68	5.12	8.23 (7.41~9.05)	5.41 (4.87~5.95)	22.1	2021/11/30
D835V2	Head	2.36	1.53	9.44	6.12	9.41 (8.47~10.35)	6.25 (5.63~6.88)	22.1	2021/11/29
D1800V2	Head	9.44	4.99	37.76	19.96	38.4 (34.56~42.24)	20.2 (18.18~22.22)	21.9	2021/12/03
D1900V2	Head	9.66	5.01	38.64	20.04	39.7 (35.73~43.67)	20.5 (18.45~22.55)	22.0	2021/12/02

6.2.3 Detailed System Check Results

Please see the Appendix A



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6.2.4 System Valitation

Per FCC KDB 865664 D02, SAR system verification is required to confirm measurement accuracy. The SAR systems (including SAR probes, system components and software versions) used for this device were validated against its performance specifications prior to the SAR measurements. Reference dipoles are used with the required tissue-equivalent media for system validation, according to the procedures outlined in FCC KDB 865664 D01 and IEEE 1528-2013. Since SAR probe calibrations are frequency dependent, each probe calibration point must be validated at a frequency within the valid frequency range of the probe calibration point, using the system that normally operates with the probe for routine SAR measurements and according to the required tissue-equivalent media.

a tabulated summary of the system validation status, measurement frequencies, SAR probes, calibrated signal type(s) and tissue dielectric parameters has been included.

Table of SAR System validation summary:

Frequency (MHz)	Date	Probe SN	Probe Type	Probe CAL Point		PERM (εr)	COND (σ)	CW Validation			MOD.Validation		
								Sensitivity	Probe Linearity	Probe Isotropy	Modulation	Duty. Factore	PAR
750	2021/7/14	3798	EX3DV4	750	Head	41.66	0.89	PASS	PASS	PASS	N/A	N/A	N/A
835	2021/7/14	3798	EX3DV4	835	Head	42.11	0.91	PASS	PASS	PASS	GMSK	PASS	N/A
1800	2021/7/14	3798	EX3DV4	1750	Head	40.20	1.39	PASS	PASS	PASS	N/A	N/A	N/A
1900	2021/7/14	3798	EX3DV4	1900	Head	40.58	1.37	PASS	PASS	PASS	GMSK	PASS	N/A
2450	2021/7/14	3798	EX3DV4	2450	Head	40.16	1.83	PASS	PASS	PASS	OFDM	PASS	N/A
2600	2021/7/14	3798	EX3DV4	2600	Head	38.59	1.98	PASS	PASS	PASS	TDD	PASS	N/A
5250	2021/7/14	3798	EX3DV4	5250	Head	36.01	4.72	PASS	PASS	PASS	OFDM	PASS	N/A
5600	2021/7/14	3798	EX3DV4	5600	Head	35.06	5.11	PASS	PASS	PASS	OFDM	PASS	N/A
5750	2021/7/14	3798	EX3DV4	5750	Head	34.70	5.28	PASS	PASS	PASS	OFDM	PASS	N/A

NOTE: While the probes have been calibrated for both CW and modulated signals, all measurements were performed using communication systems calibrated for CW signals only. Modulations in the table above represent test configurations for which the measurement system has been validated per FCC KDB Publication 865664D01 for scenarios when CW probe calibrations are used with other signal types. SAR systems were validated for modulated signals with a periodic duty cycle, such as GMSK, or with a high peak to average ratio (>5dB), such as OFDM according to KDB 865664.



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7 Test Configuration

7.1 Operation Configurations

7.1.1 GSM Test Configuration

SAR tests for GSM900 and GSM1800, a communication link is set up with a base station by air link. Using CMW500 the power lever is set to "5" and "0" in SAR of GSM900 and GSM1800. The tests in the band of GSM900 and GSM1800 are performed in the mode of GPRS/EGPRS function. Since the GPRS class is 12 for this EUT, it has at most 4 timeslots in uplink and at most 4 timeslots in downlink, the maximum total timeslot is 5. The EGPRS class is 12 for this EUT, it has at most 4 timeslots in uplink, and at most 4 timeslots in downlink, the maximum total timeslot is 5.

SAR test reduction for GPRS and EDGE modes is determined by the source-based time-averaged output power specified for production units. 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, the higher number time-slot configuration should be tested.

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

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



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7.1.2 LTE Test Configuration

Establishing connections with base station simulators ensure a consistent means for testing SAR and are recommended for evaluating SAR. The R&S CMW500 was used for LTE output power measurements and SAR testing. Max power control was used so the UE transmits with maximum output power during SAR testing. SAR must be measured with the maximum TTI (transmit time interval) supported by the device in each LTE configuration.

A) Spectrum Plots for RB Configurations

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

B) MPR

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

Modulation	Channel bandwidth / Transmission bandwidth (N_{RB})						MPR (dB)
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1
16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2

C) A-MPR

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

D) Largest channel bandwidth standalone SAR test requirements

1) QPSK with 1 RB allocation

Start with the largest channel bandwidth and measure SAR for QPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power for RB offsets at the upper edge, middle and lower edge of each required test channel. When the measured SAR is ≤ 1.0 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 measured SAR of a required test channel is > 1.80 W/kg, SAR is required for all three RB offset configurations for that required test channel.

2) QPSK with 50% RB allocation

For QPSK with 50% RB allocation, SAR is only required measure for the worst case of 1RB allocation used the highest maximum output power.

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 measured SAR for 1 RB and 50% RB allocation in 1) and 2) are ≤ 1.0 W/kg. Otherwise, SAR is measured for the highest output power channel and if the measured SAR is > 1.80 W/kg, the remaining required test channels must also be tested.

4) Higher order modulations

For each modulation besides QPSK; e.g., 16-QAM, 64-QAM, apply the QPSK procedures in above sections to determine the QAM configurations that may need SAR measurement. For each configuration identified as



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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 measured SAR for the QPSK configuration is > 1.80 W/kg.

E) Other channel bandwidth standalone SAR test requirements

For the other channel bandwidths used by the device in a frequency band, apply all the procedures required for the largest channel bandwidth in section A) to determine the channels and RB configurations that need SAR testing and only measure SAR when the highest maximum output power of a configuration requiring testing in the smaller channel bandwidth is $> \frac{1}{2}$ dB higher than the equivalent channel configurations in the largest channel bandwidth configuration or the measured SAR of a configuration for the largest channel bandwidth is > 1.80 W/kg.



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8 Test Result

8.1 Measurement of RF Conducted Power

8.1.1 Conducted Power Of GSM

GSM 850										
Burst Output Power(dBm)					Tune up	Division Factors	Frame-Average Output Power(dBm)			Tune up
Channel		128	190	251			128	190	251	
GPRS/EGPRS (GMSK)	1 TX Slot	33.08	33.1	33.26	34	-9.01	24.07	24.09	24.25	24.99
	2 TX Slots	32.38	31.68	31.85	33	-6.02	26.36	25.66	25.83	26.98
	3 TX Slots	29.36	29.51	29.69	30	-4.26	25.1	25.25	25.43	25.74
	4 TX Slots	29.07	29.24	29.45	30	-3.01	26.06	26.23	26.44	26.99
EGPRS(8PSK)	1 TX Slot	27.29	27.22	27.22	28	-9.01	18.28	18.21	18.21	18.99
	2 TX Slots	25.89	25.67	25.79	26.5	-6.02	19.87	19.65	19.77	20.48
	3 TX Slots	24.62	23.12	23.17	25	-4.26	20.36	18.86	18.91	20.74
	4 TX Slots	22.6	22.51	22.54	23	-3.01	19.59	19.5	19.53	19.99
GSM 1900										
Burst Output Power(dBm)					Tune up	Division Factors	Frame-Average Output Power(dBm)			Tune up
Channel		512	661	810			512	661	810	
GPRS/EGPRS (GMSK)	1 TX Slot	18.95	18.67	18.36	19	-9.01	9.94	9.66	9.35	9.99
	2 TX Slots	18.9	18.66	18.35	19	-6.02	12.88	12.64	12.33	12.98
	3 TX Slots	18.72	18.55	18.24	19	-4.26	14.46	14.29	13.98	14.74
	4 TX Slots	18.57	18.42	18.12	19	-3.01	15.56	15.41	15.11	15.99
EGPRS(8PSK)	1 TX Slot	25.8	25.46	25.53	26	-9.01	16.79	16.45	16.52	16.99
	2 TX Slots	24.55	24.37	25.17	26	-6.02	18.53	18.35	19.15	19.98
	3 TX Slots	21.06	20.93	20.87	21.5	-4.26	16.8	16.67	16.61	17.24
	4 TX Slots	20.7	20.65	20.51	21	-3.01	17.69	17.64	17.5	17.99



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8.1.2 Conducted Power of CatM1

LTE Band 2				Conducted Power(dBm)			
Bandwidth	Modulation	RB size	RB offset	Channel	Channel	Channel	Tune up
				18607	18900	19193	
1.4MHz	QPSK	1	0	22.03	23.06	21.93	23.5
		1	2	21.97	23.1	21.91	23.5
		1	5	22.05	23.05	21.87	23.5
		3	0	22.08	22.98	21.88	23.5
		3	2	22.11	23.04	21.95	23.5
		3	3	22.09	23	21.97	23.5
	16QAM	6	0	21.1	22.09	20.89	22.5
		1	0	21.36	21.62	21.12	22.5
		1	2	21.25	21.56	21.09	22.5
		1	5	21.27	21.62	21	22.5
		3	0	21.27	22.05	20.79	22.5
		3	2	21.36	21.98	20.79	22.5
		3	3	21.31	21.99	20.77	22.5
		6	0	20.08	21.06	19.87	21.5
Bandwidth	Modulation	RB size	RB offset	Channel	Channel	Channel	Tune up
				18615	18900	19185	
3MHz	QPSK	1	0	22.07	23.08	21.87	23.5
		1	2	21.94	23.07	21.92	23.5
		1	5	22.05	23.06	21.9	23.5
		3	0	22.09	23.06	21.85	22.5
		3	2	22.09	23.01	21.96	22.5
		3	3	22.13	23.01	21.9	22.5
	16QAM	6	0	21.1	22.05	20.9	22.5
		1	0	21.31	21.6	21.1	23
		1	2	21.25	21.53	21.15	23
		1	5	21.21	21.59	21.05	23
		3	0	21.28	22.1	20.78	22
		3	2	21.32	22.02	20.79	22
		3	3	21.27	21.96	20.76	22
		6	0	20.11	21.02	19.94	21.5
Bandwidth	Modulation	RB size	RB offset	Channel	Channel	Channel	Tune up
				18625	18900	19175	
5MHz	QPSK	1	0	22.1	23.06	21.85	23.5
		1	2	22.02	23.12	21.93	23.5
		1	5	22.06	23.01	21.91	23.5
		3	0	22.05	23.03	21.85	22.5
		3	2	22.09	23.03	21.94	22.5
		3	3	22.12	22.98	21.98	22.5
		6	0	21.06	22.09	20.83	22.5
	16QAM	1	0	21.34	21.6	21.05	23

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		1	2	21.26	21.56	21.12	23
		1	5	21.2	21.6	21	23
		3	0	21.28	22.07	20.8	22
		3	2	21.35	22.01	20.81	22
		3	3	21.23	21.98	20.72	22
		6	0	20.01	21.07	19.88	21.5
Bandwidth	Modulation	RB size	RB offset	Channel	Channel	Channel	Tune up
				18650	18900	19150	
10MHz	QPSK	1	0	22.09	22.99	21.9	23.5
		1	2	21.93	23.02	21.89	23.5
		1	5	22.07	23.05	21.91	23.5
		3	0	22.08	23.01	21.83	22.5
		3	2	22.14	23.02	22	22.5
		3	3	22.1	22.98	21.91	22.5
		6	0	21.05	22.06	20.83	22.5
	16QAM	1	0	21.34	21.65	21.07	23
		1	2	21.29	21.55	21.07	23
		1	5	21.24	21.57	21.07	23
		3	0	21.3	22.03	20.76	22
		3	2	21.35	22.06	20.8	22
		3	3	21.33	21.97	20.77	22
		6	0	20.01	21.07	19.9	21.5
Bandwidth	Modulation	RB size	RB offset	Channel	Channel	Channel	Tune up
				18675	18900	19125	
15MHz	QPSK	1	0	22.1	23	21.93	23.5
		1	2	22.01	23.04	21.94	23.5
		1	5	22.06	23.06	21.92	23.5
		3	0	22.02	23.05	21.89	22.5
		3	2	22.13	23.02	21.96	22.5
		3	3	22.04	22.98	21.92	22.5
		6	0	21.07	22.08	20.85	22.5
	16QAM	1	0	21.27	21.67	21.08	23
		1	2	21.28	21.56	21.1	23
		1	5	21.23	21.6	21.03	23
		3	0	21.32	22.04	20.76	22
		3	2	21.32	22.04	20.83	22
		3	3	21.24	22.03	20.76	22
		6	0	20.07	21	19.94	21.5
Bandwidth	Modulation	RB size	RB offset	Channel	Channel	Channel	Tune up
				18700	18900	19100	
20MHz	QPSK	1	0	22.03	23.3	21.88	23.5
		1	2	21.96	23.1	21.87	23.5
		1	5	22.01	23.02	21.94	23.5
		3	0	22.05	23.06	21.82	22.5
		3	2	22.07	22.97	22.02	22.5
		3	3	22.13	22.96	21.9	22.5



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		6	0	21.06	22	20.87	22.5
		1	0	21.29	21.67	21.09	23
		1	2	21.24	21.58	21.1	23
		1	5	21.25	21.55	21.01	23
	16QAM	3	0	21.29	22.06	20.82	22
		3	2	21.3	22.02	20.85	22
		3	3	21.28	22.04	20.78	22
		6	0	20.08	21.03	19.94	21.5

LTE Band 4				Conducted Power(dBm)			
Bandwidth	Modulation	RB size	RB offset	Channel	Channel	Channel	Tune up
				19957	20175	20393	
1.4MHz	QPSK	1	0	22.08	22.99	21.87	23.5
		1	2	22.01	23.09	21.93	23.5
		1	5	22.04	23.07	21.91	23.5
		3	0	22.1	23.03	21.85	23.5
		3	2	22.06	23.03	21.95	23.5
		3	3	22.04	23	21.97	23.5
	16QAM	6	0	21.07	22.02	20.83	23
		1	0	21.33	21.62	21.13	23
		1	2	21.23	21.55	21.07	23
		1	5	21.21	21.61	20.99	23
		3	0	21.28	22.1	20.76	23
		3	2	21.31	22.05	20.76	23
		3	3	21.3	22.05	20.79	23
		6	0	20.03	21.07	19.89	22
Bandwidth	Modulation	RB size	RB offset	Channel	Channel	Channel	Tune up
				19965	20175	20385	
3MHz	QPSK	1	0	22.03	23.03	21.9	23.5
		1	2	21.97	23.08	21.88	23.5
		1	5	22.09	23.09	21.95	23.5
		3	0	22.03	22.99	21.86	23.5
		3	2	22.14	22.98	21.96	23.5
		3	3	22.09	23.02	21.96	23.5
	16QAM	6	0	21.06	22.04	20.82	23
		1	0	21.29	21.64	21.12	23
		1	2	21.23	21.52	21.07	23
		1	5	21.27	21.55	21.05	23
		3	0	21.27	22.09	20.81	22
		3	2	21.34	21.99	20.81	22
		3	3	21.32	22.01	20.8	22
		6	0	20.03	21.06	19.89	22
Bandwidth	Modulation	RB size	RB offset	Channel	Channel	Channel	Tune up
				19975	20175	20375	
5MHz	QPSK	1	0	22.02	23	21.86	23.5



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	16QAM	1	2	21.97	23.1	21.86	23.5
		1	5	22.08	23.08	21.93	23.5
		3	0	22.11	23.03	21.86	23.5
		3	2	22.07	22.97	22.02	23.5
		3	3	22.09	23	21.89	23.5
		6	0	21.12	22.02	20.84	23
		1	0	21.28	21.68	21.05	23
		1	2	21.26	21.57	21.14	23
		1	5	21.25	21.55	21.06	23
		3	0	21.31	22.03	20.82	22
		3	2	21.35	21.99	20.82	22
		3	3	21.25	22.02	20.72	22
		6	0	20.08	21.05	19.92	22
Bandwidth	Modulation	RB size	RB offset	Channel	Channel	Channel	Tune up
				20000	20175	20350	
10MHz	QPSK	1	0	22.06	23.01	21.88	23.5
		1	2	21.97	23.04	21.86	23.5
		1	5	22.04	23.04	21.86	23.5
		3	0	22.03	23.07	21.84	23.5
		3	2	22.11	22.97	22	23.5
		3	3	22.04	22.99	21.93	23.5
	16QAM	6	0	21.06	22.01	20.8	23
		1	0	21.27	21.64	21.08	23
		1	2	21.25	21.55	21.15	23
		1	5	21.23	21.54	21.05	23
		3	0	21.33	22.05	20.77	22
		3	2	21.31	22.01	20.76	22
		3	3	21.28	22.03	20.74	22
		6	0	20.07	21.04	19.92	22
Bandwidth	Modulation	RB size	RB offset	Channel	Channel	Channel	Tune up
				20025	20175	20325	
15MHz	QPSK	1	0	22.04	23.06	21.94	23.5
		1	2	21.94	23.05	21.87	23.5
		1	5	22.07	23.03	21.85	23.5
		3	0	22.05	22.98	21.84	23.5
		3	2	22.04	22.97	21.95	23.5
		3	3	22.08	23.03	21.95	23.5
	16QAM	6	0	21.14	22.06	20.83	23
		1	0	21.35	21.61	21.08	23
		1	2	21.26	21.57	21.16	23
		1	5	21.21	21.59	21.04	23
		3	0	21.36	22.04	20.78	22
		3	2	21.33	21.98	20.79	22
		3	3	21.25	22.01	20.73	22
		6	0	20.06	21.03	19.92	22
Bandwidth	Modulation	RB	RB offset	Channel	Channel	Channel	Tune up

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		size		20050	20175	20300	
20MHz	QPSK	1	0	22.1	23.09	21.93	24
		1	2	21.94	23.08	21.88	24
		1	5	22.07	23.08	21.9	24
		3	0	22.11	23.06	21.86	24
		3	2	22.11	23.02	22	24
		3	3	22.08	23	21.99	24
		6	0	21.04	22.03	20.85	23
	16QAM	1	0	21.32	21.68	21.12	23
		1	2	21.21	21.49	21.06	23
		1	5	21.23	21.61	21.04	23
		3	0	21.35	22.08	20.74	22
		3	2	21.31	22	20.77	22
		3	3	21.32	21.96	20.78	22
		6	0	20.1	21.09	19.88	22

LTE FDD Band 12				Conducted Power(dBm)			
Bandwidth	Modulation	RB size	RB offset	Channel	Channel	Channel	Tune up
				23017	23095	23173	
1.4MHz	QPSK	1	0	22.11	23.02	21.86	24
		1	2	22.01	23.04	21.88	24
		1	5	22.01	23.02	21.91	24
		3	0	22.04	23.03	21.89	24
		3	2	22.08	22.98	21.98	24
		3	3	22.11	22.98	21.92	24
		6	0	21.11	22.01	20.9	23
	16QAM	1	0	21.33	21.68	21.14	23
		1	2	21.29	21.51	21.13	23
		1	5	21.26	21.61	21.07	23
		3	0	21.27	22.03	20.78	23
		3	2	21.32	22.03	20.83	23
		3	3	21.3	21.98	20.78	23
		6	0	20.06	21.05	19.89	22
Bandwidth	Modulation	RB size	RB offset	Channel	Channel	Channel	Tune up
				23025	23095	23165	
3MHz	QPSK	1	0	22.11	23.06	21.91	24
		1	2	21.97	23.07	21.93	24
		1	5	22.1	23	21.86	24
		3	0	22.09	23	21.9	23
		3	2	22.12	22.96	21.96	23
		3	3	22.09	23.06	21.93	23
		6	0	21.06	22.02	20.81	23
	16QAM	1	0	21.3	21.63	21.05	23
		1	2	21.27	21.5	21.14	23
		1	5	21.2	21.58	21.06	23

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EMC Laboratory

		3	0	21.28	22.05	20.74	22
		3	2	21.35	22.02	20.78	22
		3	3	21.28	22.01	20.76	22
		6	0	20.09	21.04	19.9	22
Bandwidth	Modulation	RB size	RB offset	Channel	Channel	Channel	Tune up
				23035	23095	23155	
5MHz	QPSK	1	0	22.03	23.03	21.86	24
		1	2	21.98	23.06	21.94	24
		1	5	22.05	23.01	21.87	24
		3	0	22.03	23.03	21.87	23
		3	2	22.13	23.04	21.93	23
		3	3	22.09	22.96	21.96	23
		6	0	21.14	22.01	20.89	23
	16QAM	1	0	21.34	21.6	21.14	23
		1	2	21.21	21.55	21.06	23
		1	5	21.22	21.63	21.04	23
		3	0	21.33	22.09	20.73	22
		3	2	21.29	22.01	20.79	22
		3	3	21.28	22.03	20.74	22
		6	0	20.03	21	19.95	22
Bandwidth	Modulation	RB size	RB offset	Channel	Channel	Channel	Tune up
				23060	23095	23130	
10MHz	QPSK	1	0	23	23.02	23.09	24
		1	2	22.98	23.05	21.87	24
		1	5	22.03	23.08	21.9	24
		3	0	22.09	23.02	21.88	23
		3	2	22.09	23	21.94	23
		3	3	22.1	22.98	21.96	23
		6	0	21.08	22.02	20.83	23
	16QAM	1	0	21.3	21.6	21.06	23
		1	2	21.29	21.56	21.07	23
		1	5	21.2	21.61	21.04	23
		3	0	21.36	22.09	20.81	22
		3	2	21.3	22.02	20.77	22
		3	3	21.25	22.03	20.75	22
		6	0	20.03	21.07	19.87	22

LTE FDD Band 13				Conducted Power(dBm)			
Bandwidth	Modulation	RB size	RB offset	Channel	Channel	Channel	Tune up
				23205	23230	23255	
5MHz	QPSK	1	0	22.1	23	21.91	24
		1	2	22.03	23.11	21.93	24
		1	5	22.08	23.07	21.87	24
		3	0	22.03	23.01	21.89	23.5
		3	2	22.1	22.96	22	23.5

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	16QAM	3	3	22.08	23.04	21.94	23.5
		6	0	21.1	22.03	20.84	23.5
		1	0	21.3	21.69	21.08	23
		1	2	21.3	21.58	21.11	23
		1	5	21.26	21.59	21	23
		3	0	21.37	22.01	20.79	23
		3	2	21.37	22.07	20.79	23
		3	3	21.31	22	20.75	23
		6	0	20.06	21.05	19.91	23
Bandwidth	Modulation	RB size	RB offset	Channel	Channel	Channel	Tune up
				NA	23230	NA	
10MHz	QPSK	1	0	NA	22.99	NA	24
		1	2	NA	23.09	NA	24
		1	5	NA	23.06	NA	24
		3	0	NA	23.03	NA	23.5
		3	2	NA	23.02	NA	23.5
		3	3	NA	23.01	NA	23.5
		6	0	NA	22.02	NA	23.5
	16QAM	1	0	NA	22.08	NA	23
		1	2	NA	22.01	NA	23
		1	5	NA	22.09	NA	23
		3	0	NA	22.07	NA	23
		3	2	NA	22.05	NA	23
		3	3	NA	22.06	NA	23
		6	0	NA	21.05	NA	23

LTE Band 25				Conducted Power(dBm)			
Bandwidth	Modulation	RB size	RB offset	Channel	Channel	Channel	Tune up
				26047	26365	26683	
1.4MHz	QPSK	1	0	22.08	23.04	21.85	23.5
		1	2	22.02	23.11	21.88	23.5
		1	5	22.08	23.09	21.91	23.5
		3	0	22.07	23.03	21.86	23.5
		3	2	22.14	22.96	21.97	23.5
		3	3	22.04	23	21.93	23.5
		6	0	21.05	22.1	20.83	23
	16QAM	1	0	21.33	21.68	21.14	23
		1	2	21.22	21.49	21.08	23
		1	5	21.26	21.57	21.07	23
		3	0	21.3	22.08	20.8	22.5
		3	2	21.36	22.04	20.78	22.5
		3	3	21.33	21.99	20.72	22.5
		6	0	20.05	21.02	19.91	22.5
Bandwidth	Modulation	RB size	RB offset	Channel	Channel	Channel	Tune up
				26055	26365	26675	



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3MHz	QPSK	1	0	22.12	23.05	21.86	23.5
		1	2	22.01	23.08	21.85	23.5
		1	5	22.06	23.04	21.9	23.5
		3	0	22.07	22.99	21.86	23.5
		3	2	22.09	22.98	21.97	23.5
		3	3	22.08	23.04	21.93	23.5
		6	0	21.05	22.09	20.86	23
	16QAM	1	0	21.33	21.6	21.09	23
		1	2	21.25	21.56	21.16	23
		1	5	21.26	21.58	21.04	23
		3	0	21.37	22.06	20.79	22.5
		3	2	21.37	22.03	20.82	22.5
		3	3	21.33	22.05	20.73	22.5
		6	0	20.1	21.08	19.9	22.5
Bandwidth	Modulation	RB size	RB offset	Channel 26065	Channel 26365	Channel 26665	Tune up
5MHz	QPSK	1	0	22.03	23.02	21.87	23.5
		1	2	21.99	23.07	21.86	23.5
		1	5	22.05	23.05	21.85	23.5
		3	0	22.07	23.05	21.86	23.5
		3	2	22.08	23	22.02	23.5
		3	3	22.08	23.06	21.93	23.5
		6	0	21.09	22.06	20.84	23
	16QAM	1	0	21.27	21.65	21.06	23
		1	2	21.27	21.58	21.12	23
		1	5	21.2	21.62	21.07	23
		3	0	21.34	22.09	20.82	22.5
		3	2	21.33	21.97	20.8	22.5
		3	3	21.23	22.04	20.75	22.5
		6	0	20.03	20.99	19.88	22.5
Bandwidth	Modulation	RB size	RB offset	Channel 26090	Channel 26365	Channel 26640	Tune up
10MHz	QPSK	1	0	22.08	23.04	21.87	23.5
		1	2	21.98	23.09	21.94	23.5
		1	5	22.01	23.07	21.9	23.5
		3	0	22.12	23.02	21.82	23.5
		3	2	22.11	23.01	21.96	23.5
		3	3	22.08	23.01	21.95	23.5
		6	0	21.09	22.08	20.85	23
	16QAM	1	0	21.28	21.64	21.13	23
		1	2	21.22	21.55	21.14	23
		1	5	21.19	21.55	21.03	23
		3	0	21.35	22.08	20.78	22.5
		3	2	21.38	22.07	20.8	22.5
		3	3	21.24	22.04	20.71	22.5
		6	0	20.01	21.02	19.92	22.5

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Bandwidth	Modulation	RB size	RB offset	Channel	Channel	Channel	Tune up
				26115	26365	26615	
15MHz	QPSK	1	0	22.07	23.03	21.91	23.5
		1	2	22.02	23.03	21.94	23.5
		1	5	22.04	23.04	21.89	23.5
		3	0	22.08	23.05	21.82	23.5
		3	2	22.13	23.01	22.02	23.5
		3	3	22.09	22.98	21.93	23.5
		6	0	21.05	22.07	20.9	23
	16QAM	1	0	21.27	21.65	21.1	23
		1	2	21.25	21.53	21.12	23
		1	5	21.29	21.56	21.06	23
		3	0	21.35	22.02	20.74	22.5
		3	2	21.3	22.04	20.84	22.5
		3	3	21.28	22.03	20.76	22.5
		6	0	20.1	21.09	19.93	22.5
Bandwidth	Modulation	RB size	RB offset	Channel	Channel	Channel	Tune up
				26140	26365	26590	
20MHz	QPSK	1	0	22.06	22.99	21.91	23.5
		1	2	21.97	23.06	21.88	23.5
		1	5	22.04	23.01	21.93	23.5
		3	0	22.03	23.05	21.85	23.5
		3	2	22.06	23.03	21.99	23.5
		3	3	22.1	22.96	21.91	23.5
		6	0	21.05	22	20.84	23
	16QAM	1	0	21.3	21.63	21.05	23
		1	2	21.28	21.54	21.1	23
		1	5	21.28	21.56	21.06	23
		3	0	21.35	22.02	20.75	22.5
		3	2	21.39	22.03	20.82	22.5
		3	3	21.27	21.97	20.81	22.5
		6	0	20.1	21.07	19.94	22.5

8.2 Stand-alone SAR test evaluation

Unless specifically required by the published RF exposure KDB procedures, standalone 1-g head or body and 10-g extremity SAR evaluation for general population exposure conditions, by measurement or numerical simulation, is not required when the corresponding SAR Test Exclusion Threshold condition is satisfied. These test exclusion conditions are based on source-based time-averaged maximum conducted output power of the RF channel requiring evaluation, adjusted for tune-up tolerance, and the minimum test separation distance required for the exposure conditions.

Freq. Band	Frequency (GHz)	Position	Average Power		Test Separation (mm)	Calculate Value	Exclusion Threshold	Exclusion (Y/N)
			dBm	mW				



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GSM850	0.848	Extremity	33	1995.3	0	367.5	7.5	N
GSM1900	1.909	Extremity	26	398.1	0	110.0	7.5	N
LTE Band 2	1.91	Extremity	23.5	223.9	0	61.9	7.5	N
LTE Band 4	1.755	Extremity	24	251.2	0	66.6	7.5	N
LTE Band 12	0.716	Extremity	24	251.2	0	42.5	7.5	N
LTE Band 13	0.787	Extremity	24	251.2	0	44.6	7.5	N
LTE Band 25	1.915	Extremity	23.5	223.9	0	62.0	7.5	N

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

The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

8.3 Measurement of SAR Data

8.3.1 SAR Result Of GSM 850

Test position	Test mode	Test Ch./Freq.	Duty Cycle	SAR (W/kg) 1-g	SAR (W/kg) 10-g	Power Drift (dB)	Conducted Power (dBm)	Tune up Limit (dBm)	Scaled factor	Scaled SAR (W/kg) 10-g	Liquid Temp	SAR limit (W/kg)
Extremity test data(0mm)												
Front side	GPRS 4TS	128/824.2	1:2.075	0.817	0.487	-0.18	29.07	30	1.239	0.603	22.1	4

Note:

- 1) The maximum Scaled SAR value is marked in bold. Graph Results refer to Appendix B
- 2) Per FCC KDB Publication 447498 D01, if the reported (scaled) SAR measured at the middle channel or highest output power channel for each test configuration is ≤ 0.8 W/kg (2.0W/kg for 10g) then testing at the other channels is not required for such test configuration(s).



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8.3.2 SAR Result Of PCS 1900

Test position	Test mode	Test Ch./Freq.	Duty Cycle	SAR (W/kg) 1-g	SAR (W/kg) 10-g	Power Drift(dB)	Conducted Power (dBm)	Tune up Limit (dBm)	Scaled factor	Scaled SAR (W/kg) 10-g	Liquid Temp	SAR limit (W/kg)
Extremity test data(0mm)												
Front side	GPRS 4TS	512/1850.2	1:2.075	2.17	1.2	0.03	18.57	19	1.104	1.325	22.3	4

Note:

- 3) The maximum Scaled SAR value is marked in bold. Graph Results refer to Appendix B
- 4) 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 (2.0W/kg for 10g) then testing at the other channels is not required for such test configuration(s).



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8.3.3 SAR Result Of LTE CatM1 band 2

Test position	Test mode	Test Ch./Freq.	Duty Cycle	SAR (W/kg) 1-g	SAR (W/kg) 10-g	Power Drift (dB)	Conducted Power (dBm)	Tune up Limit (dBm)	Scaled factor	Scaled SAR (W/kg) 10-g	Liquid Temp	SAR limit (W/kg)
Extremity test data(0mm)												
Front side	20M_QPSK 1RB_0	18900/1880	1:1	0.328	0.185	-0.07	23.3	23.5	1.047	0.194	22.3	4

Note:

- 5) The maximum Scaled SAR value is marked in bold. Graph Results refer to Appendix B
- 6) 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 (2.0W/kg for 10g) then testing at the other channels is not required for such test configuration(s).



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8.3.4 SAR Result Of LTE CatM1 band 4

Test position	Test mode	Test Ch./Freq.	Duty Cycle	SAR (W/kg) 1-g	SAR (W/kg) 10-g	Power Drift (dB)	Conducted Power (dBm)	Tune up Limit (dBm)	Scaled factor	Scaled SAR (W/kg) 10-g	Liquid Temp	SAR limit (W/kg)
Extremity test data(0mm)												
Front side	20M_QPSK 1RB_0	20175/1732.5	1:1	0.306	0.173	-0.07	23.09	24	1.233	0.213	22.2	4

Note:

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

8) 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 (2.0W/kg for 10g) then testing at the other channels is not required for such test configuration(s).

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8.3.5 SAR Result Of LTE CatM1 band 12

Test position	Test mode	Test Ch./Freq.	Duty Cycle	SAR (W/kg) 1-g	SAR (W/kg) 10-g	Power Drift (dB)	Conducted Power (dBm)	Tune up Limit (dBm)	Scaled factor	Scaled SAR (W/kg) 10-g	Liquid Temp	SAR limit (W/kg)
Extremity test data(0mm)												
Front side	10M_QPSK 1RB_2	23130/711	1:1	0.71	0.426	-0.18	23.09	24	1.233	0.525	22.1	4

Note:

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

10) 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 (2.0W/kg for 10g) then testing at the other channels is not required for such test configuration(s).



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8.3.6 SAR Result Of LTE CatM1 band 13

Test position	Test mode	Test Ch./Freq.	Duty Cycle	SAR (W/kg) 1-g	SAR (W/kg) 10-g	Power Drift (dB)	Conducted Power (dBm)	Tune up Limit (dBm)	Scaled factor	Scaled SAR (W/kg) 10-g	Liquid Temp	SAR limit (W/kg)
Extremity test data(0mm)												
Front side	10M_QPSK 1RB_2	23230/782	1:1	0.798	0.479	-0.08	23.09	24	1.233	0.591	22.1	4

Note:

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

12) 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 (2.0W/kg for 10g) then testing at the other channels is not required for such test configuration(s).

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8.3.7 SAR Result Of LTE CatM1 band 25

Test position	Test mode	Test Ch./Freq.	Duty Cycle	SAR (W/kg) 1-g	SAR (W/kg) 10-g	Power Drift (dB)	Conducted Power (dBm)	Tune up Limit (dBm)	Scaled factor	Scaled SAR (W/kg) 10-g	Liquid Temp	SAR limit (W/kg)
Extremity test data(0mm)												
Front side	20M_QPSK 1RB_2	26365/1882.5	1:1	0.328	0.186	-0.07	23.06	23.5	1.107	0.206	22.1	4

Note:

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

14) 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 (2.0W/kg for 10g) then testing at the other channels is not required for such test configuration(s).

8.4 Multiple Transmitter Evaluation

8.4.1 Simultaneous SAR test evaluation

Simultaneous Transmission

NO.	Simultaneous Transmission Configuration	Extremity
1	GSM + LTE	No



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9 Equipment list

Test Platform		SPEAG DASY5 Professional				
Location		Compliance Certification Services (Kunshan) Inc.				
Software Reference		DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)				
Hardware Reference						
Equipment		Manufacturer	Model	Serial Number	Calibration Date	Due date of calibration
<input checked="" type="checkbox"/>	P C	HP	Core(rm)3.16G	CZCO48171H	N/A	N/A
<input checked="" type="checkbox"/>	Signal Generator	Agilent	N5182A	MY50142015	2021/09/24	2022/09/23
<input checked="" type="checkbox"/>	S-Parameter Network Analyzer	Agilent	E5071B	MY42301382	2021/02/01	2022/01/31
<input checked="" type="checkbox"/>	DAK-3.5 probe	SPEAG	DAK-3.5	1102	N/A	N/A
<input checked="" type="checkbox"/>	Power meter	Anritsu	ML2495A	1445010	2021/04/15	2022/04/14
<input checked="" type="checkbox"/>	Power sensor	Anritsu	MA2411B	1339220	2021/04/15	2022/04/14
<input checked="" type="checkbox"/>	DAE	SPEAG	DAE4	1245	2021/05/19	2022/05/18
<input checked="" type="checkbox"/>	E-field PROBE	SPEAG	EX3DV4	3798	2021/05/31	2022/05/30
<input checked="" type="checkbox"/>	Dipole	SPEAG	D750V2	1188	2019/03/07	2022/03/06
<input checked="" type="checkbox"/>	Dipole	SPEAG	D900V2	1d079	2019/06/13	2022/06/12
<input checked="" type="checkbox"/>	Dipole	SPEAG	D1800V2	2d170	2019/06/11	2022/06/10
<input checked="" type="checkbox"/>	Electro Thermometer	DTM	DTM3000	3030	2021/10/17	2022/10/16
<input checked="" type="checkbox"/>	Amplifier	Mini-circuits	ZVE-8G	110405	N/A	N/A
<input checked="" type="checkbox"/>	Amplifier	Mini-circuits	ZHL-42	QA1331003	N/A	N/A
<input checked="" type="checkbox"/>	3db ATTENUATOR	MINI	MCL BW-S3W5	0533	N/A	N/A
<input checked="" type="checkbox"/>	DUMMY PROBE	SPEAG	DP_2	SPDP2001AA	N/A	N/A
<input checked="" type="checkbox"/>	Dual Directional Coupler	Woken	20W couple	DOM2BHW1A1	N/A	N/A
<input checked="" type="checkbox"/>	SAM PHANTOM (ELI4 v4.0)	SPEAG	QDOVA001BB	1102	N/A	N/A
<input type="checkbox"/>	Twin SAM Phantom	SPEAG	QD000P40CD	1609	N/A	N/A
<input checked="" type="checkbox"/>	ROBOT	SPEAG	TX60	F10/5E6AA1/A101	N/A	N/A
<input checked="" type="checkbox"/>	ROBOT KRC	SPEAG	CS8C	F10/5E6AA1/C101	N/A	N/A
<input checked="" type="checkbox"/>	LIQUID CALIBRATION KIT	ANTENNESSA	41/05 OCP9	00425167	N/A	N/A

Note: All the equipments are within the valid period when the tests are performed.

All measurement facilities used to collect the measurement data are located at

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10 Calibration certificate

Please see the Appendix C

11 Photographs

Please see the Appendix D



Compliance Certification Services (Kunshan) Inc.
EMC Laboratory

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Appendix A: Detailed System Check Results

The plots are showing as followings.



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Test Laboratory: Compliance Certification Services (Kunshan) Inc.

System Performance Check-Head D750

DUT: Dipole 750 MHz D750V3; Type: D750V3; Serial: 1188

Communication System: UID 0, CW (0); Frequency: 750 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 750 \text{ MHz}$; $\sigma = 0.879 \text{ S/m}$; $\epsilon_r = 42.786$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 - SN3798; ConvF(9.78, 9.78, 9.78); Calibrated: 2021/05/31;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1245; Calibrated: 2021/05/19
- Phantom: ELI v4.0; Type: QDOVA001BB; Serial: TP:1102
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

System Performance Check at Frequencies Low 1 GHz/Pin=250 mW, dist=15 mm (EX-Probe)/Area Scan

(61x111x1): Interpolated grid: $dx=1.500 \text{ mm}$, $dy=1.500 \text{ mm}$

Maximum value of SAR (interpolated) = 2.53 W/kg

System Performance Check at Frequencies Low 1 GHz/Pin=250 mW, dist=15 mm (EX-Probe)/Zoom Scan

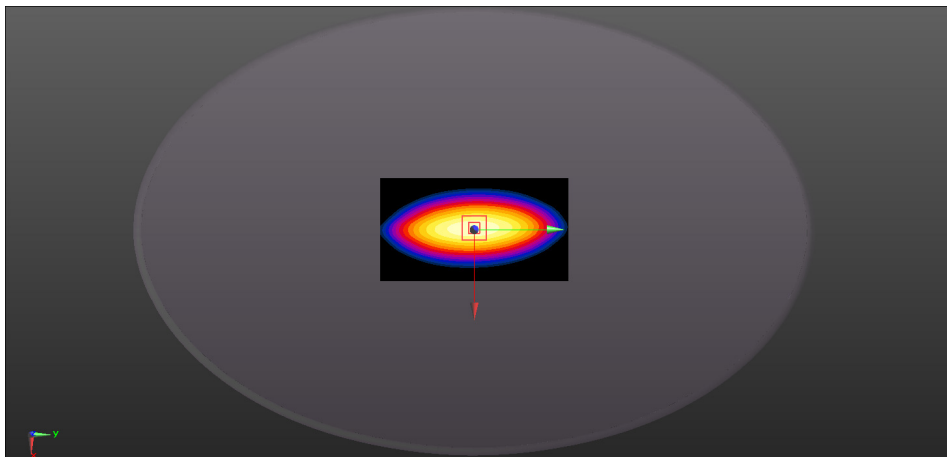
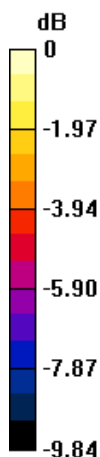
(7x7x7) (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 53.17 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 2.87 W/kg

SAR(1 g) = 1.92 W/kg; SAR(10 g) = 1.28 W/kg

Maximum value of SAR (measured) = 2.55 W/kg



0 dB = 2.55 W/kg = 4.07 dBW/kg



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Test Laboratory: Compliance Certification Services (Kunshan) Inc.

System Performance Check-Head D835

DUT: Dipole 835 MHz D835V2; Type: D835V2; Serial: D835V2 - SN4d114

Communication System: UID 0, CW; Frequency: 835 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 835$ MHz; $\sigma = 0.905$ S/m; $\epsilon_r = 42.113$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 - SN3798; ConvF(9.52, 9.52, 9.52); Calibrated: 2021/05/31;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1245; Calibrated: 2021/05/19
- Phantom: ELI v4.0; Type: QDOVA001BB; Serial: TP:1102
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

System Performance Check at Frequencies Low 1 GHz/d=15mm, Pin=250 mW, dist=3.0mm (EX-Probe)/Area Scan (61x111x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 3.67 W/kg

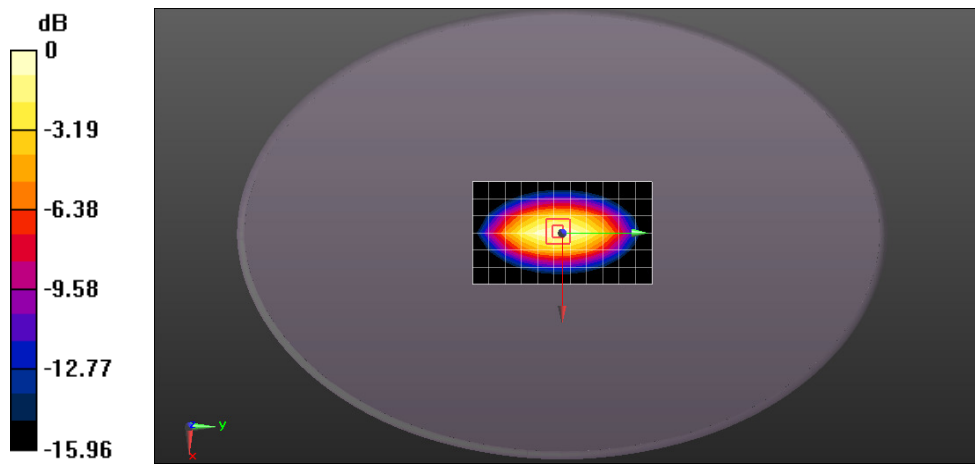
System Performance Check at Frequencies Low 1 GHz/d=15mm, Pin=250 mW, dist=3.0mm (EX-Probe)/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 61.51 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 6.98 W/kg

SAR(1 g) = 2.36 W/kg; SAR(10 g) = 1.53 W/kg

Maximum value of SAR (measured) = 4.10 W/kg



0 dB = 4.10 W/kg = 6.13 dBW/kg



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Test Laboratory: Compliance Certification Services (Kunshan) Inc.

System Performance Check-D1800

DUT: Dipole 1800 MHz D1800V2; Type: D1800V2; Serial: 2d052

Communication System: UID 10000, CW; Frequency: 1800 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 1800 \text{ MHz}$; $\sigma = 1.386 \text{ S/m}$; $\epsilon_r = 40.249$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 - SN3798; ConvF(8.22, 8.22, 8.22); Calibrated: 2021/05/31;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1245; Calibrated: 2021/05/19
- Phantom: ELI v4.0; Type: QDOVA001BB; Serial: TP:1102
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

System Performance Check at Frequencies above 1 GHz/d=10mm, Pin=250 mW(EX-Probe) (23.6 dBm)/Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 13.4 W/kg

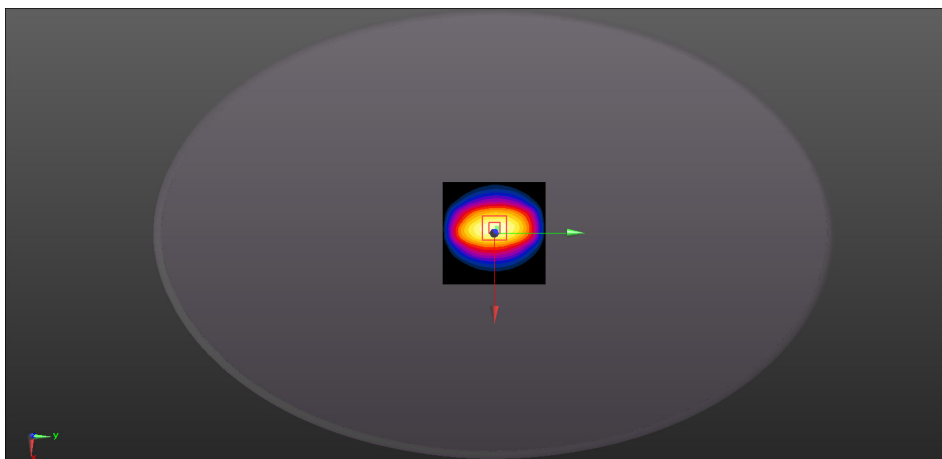
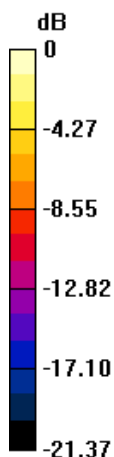
System Performance Check at Frequencies above 1 GHz/d=10mm, Pin=250 mW(EX-Probe) (23.6 dBm)/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 98.63 V/m; Power Drift = 0.19 dB

Peak SAR (extrapolated) = 18.5 W/kg

SAR(1 g) = 9.44 W/kg; SAR(10 g) = 4.99 W/kg

Maximum value of SAR (measured) = 14.7 W/kg



0 dB = 14.7 W/kg = 11.67 dBW/kg



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Test Laboratory: Compliance Certification Services (Kunshan) Inc.

System Performance Check-Head D1900

DUT: Dipole 1900 MHz D1900V2; Type: D1900V2; Serial: 5d136

Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.372$ S/m; $\epsilon_r = 40.64$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 - SN3798; ConvF(7.89, 7.89, 7.89); Calibrated: 2021/05/31;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1245; Calibrated: 2021/05/19
- Phantom: ELI v4.0; Type: QDOVA001BB; Serial: TP:1102
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

System Performance Check at Frequencies above 1 GHz/Pin=250 mW, dist=10mm (EX-Probe)/Area Scan

(61x71x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 12.5 W/kg

System Performance Check at Frequencies above 1 GHz/Pin=250 mW, dist=10mm (EX-Probe)/Zoom Scan

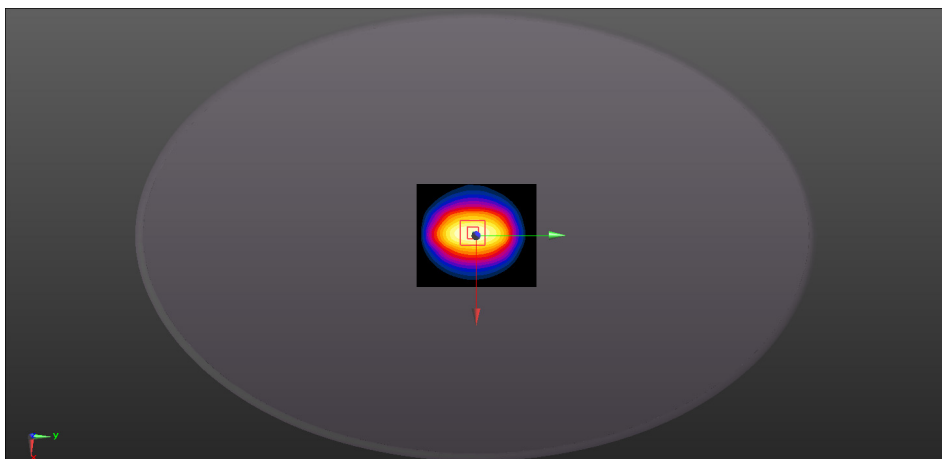
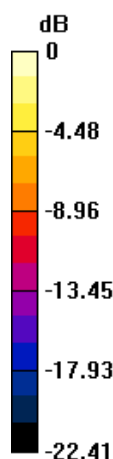
(7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 92.84 V/m; Power Drift = 0.06 dB

Peak SAR (extrapolated) = 16.6 W/kg

SAR(1 g) = 9.66 W/kg; SAR(10 g) = 5.01 W/kg

Maximum value of SAR (measured) = 11.9 W/kg



0 dB = 11.9 W/kg = 10.76 dBW/kg



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Appendix B: Detailed Test Results

The plots of worse case are showing as followings.



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Test Laboratory: Compliance Certification Services (Kunshan) Inc.

GSM850 GPRS4TS Back side 0mm Ch128

DUT: Cellular Body Scale; Type: GBS-2104-G

Communication System: UID 0, GPRS/EGPRS 4TX Slots (0); Frequency: 824.2 MHz; Duty Cycle: 1:2.0797
Medium parameters used (interpolated): $f = 824.2$ MHz; $\sigma = 0.897$ S/m; $\epsilon_r = 42.371$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 - SN3798; ConvF(9.52, 9.52, 9.52); Calibrated: 2021/05/31;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1245; Calibrated: 2021/05/19
- Phantom: ELI v4.0; Type: QDOVA001BB; Serial: TP:1102
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Configuration/Body/Area Scan (61x101x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 1.01 W/kg

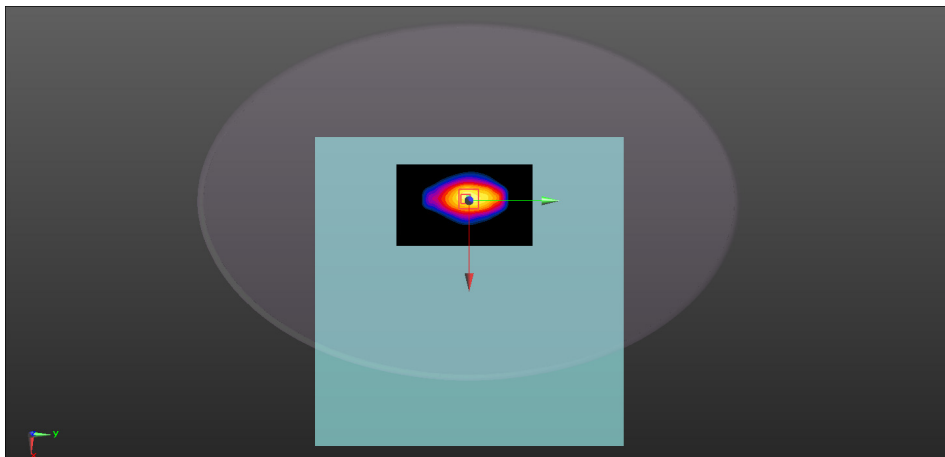
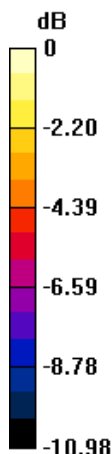
Configuration/Body/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 36.29 V/m; Power Drift = -0.18 dB

Peak SAR (extrapolated) = 1.44 W/kg

SAR(1 g) = 0.817 W/kg; SAR(10 g) = 0.487 W/kg

Maximum value of SAR (measured) = 1.24 W/kg



0 dB = 1.24 W/kg = 0.93 dBW/kg



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Test Laboratory: Compliance Certification Services (Kunshan) Inc.

GSM1900 GPRS4TS Back side 0mm Ch512

DUT: Cellular Body Scale; Type: GBS-2104-G

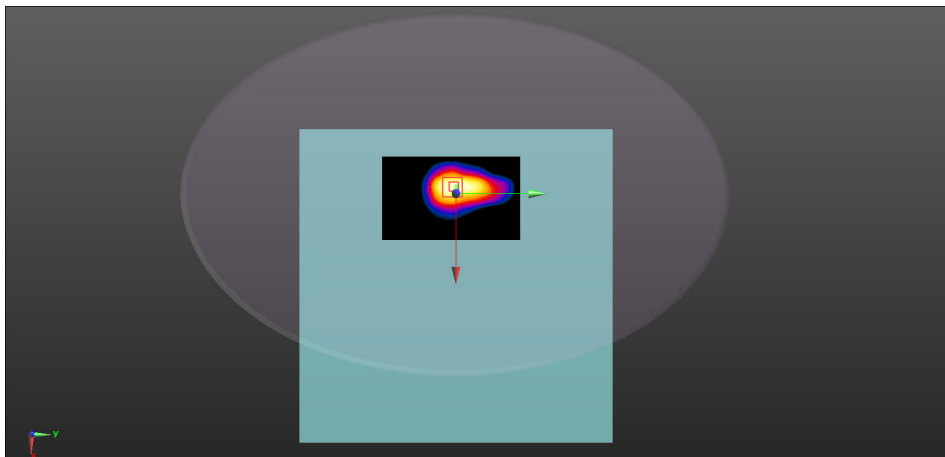
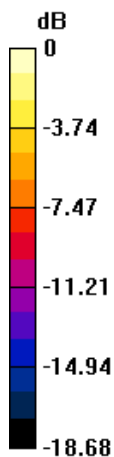
Communication System: UID 0, GPRS/EGPRS 4TX Slots (0); Frequency: 1850.2 MHz; Duty Cycle: 1:2.0797
Medium parameters used (interpolated): $f = 1850.2$ MHz; $\sigma = 1.353$ S/m; $\epsilon_r = 40.778$; $\rho = 1000$ kg/m³
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 - SN3798; ConvF(7.89, 7.89, 7.89); Calibrated: 2021/05/31;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1245; Calibrated: 2021/05/19
- Phantom: ELI v4.0; Type: QDOVA001BB; Serial: TP:1102
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Configuration/Body/Area Scan (61x101x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 3.60 W/kg

Configuration/Body/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 42.01 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 4.00 W/kg
SAR(1 g) = 2.17 W/kg; SAR(10 g) = 1.2 W/kg
Maximum value of SAR (measured) = 3.21 W/kg



0 dB = 3.21 W/kg = 5.07 dBW/kg



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Test Laboratory: Compliance Certification Services (Kunshan) Inc.

LTE CatM1 Band 2 20M QPSK 1RB0 Front side 0mm Ch18900

DUT: Cellular Body Scale; Type: GBS-2104-G

Communication System: UID 0, FDD_LTE (0); Frequency: 1880 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 1880 \text{ MHz}$; $\sigma = 1.36 \text{ S/m}$; $\epsilon_r = 40.732$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 - SN3798; ConvF(7.89, 7.89, 7.89); Calibrated: 2021/05/31;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1245; Calibrated: 2021/05/19
- Phantom: ELI v4.0; Type: QDOVA001BB; Serial: TP:1102
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Configuration/Body/Area Scan (61x101x1): Interpolated grid: $dx=1.500 \text{ mm}$, $dy=1.500 \text{ mm}$

Maximum value of SAR (interpolated) = 0.532 W/kg

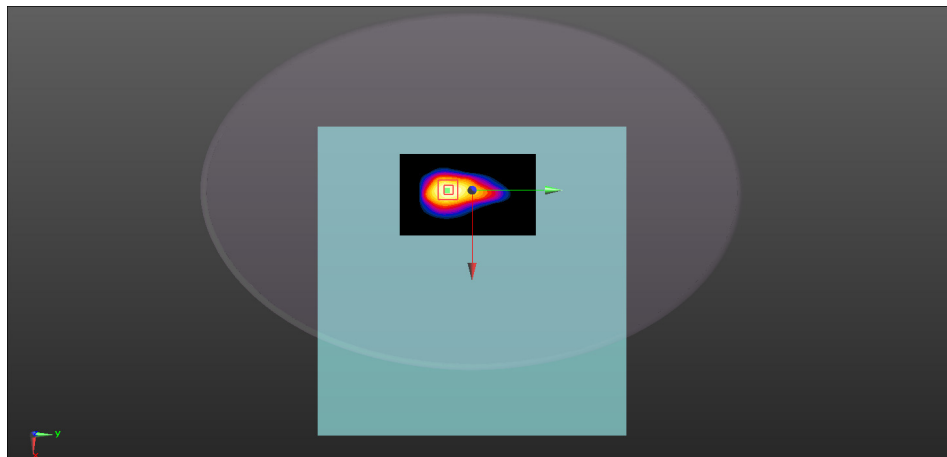
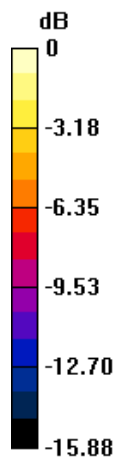
Configuration/Body/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 13.76 V/m ; Power Drift = -0.07 dB

Peak SAR (extrapolated) = 0.559 W/kg

SAR(1 g) = 0.328 W/kg ; SAR(10 g) = 0.185 W/kg

Maximum value of SAR (measured) = 0.466 W/kg



0 dB = 0.466 W/kg = -3.32 dBW/kg



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Test Laboratory: Compliance Certification Services (Kunshan) Inc.

LTE CatM1 Band 4 20M QPSK 1RB0 Back side 0mm Ch20175

DUT: Cellular Body Scale; Type: GBS-2104-G

Communication System: UID 0, FDD_LTE (0); Frequency: 1732.5 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 1732.5$ MHz; $\sigma = 1.322$ S/m; $\epsilon_r = 40.586$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 - SN3798; ConvF(8.22, 8.22, 8.22); Calibrated: 2021/05/31;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1245; Calibrated: 2021/05/19
- Phantom: ELI v4.0; Type: QDOVA001BB; Serial: TP:1102
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Configuration/Body/Area Scan (61x101x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.495 W/kg

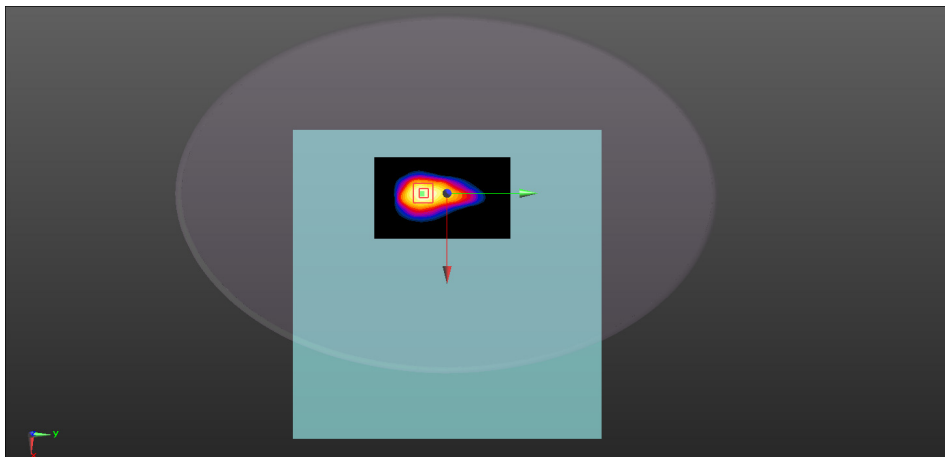
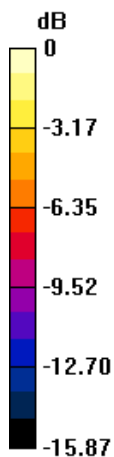
Configuration/Body/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 13.48 V/m; Power Drift = -0.07 dB

Peak SAR (extrapolated) = 0.520 W/kg

SAR(1 g) = 0.306 W/kg; SAR(10 g) = 0.173 W/kg

Maximum value of SAR (measured) = 0.434 W/kg



0 dB = 0.434 W/kg = -3.63 dBW/kg



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Test Laboratory: Compliance Certification Services (Kunshan) Inc.

LTE CatM1 Band 12 10M QPSK 1RB2 Back side 0mm Ch23130

DUT: Cellular Body Scale; Type: GBS-2104-G

Communication System: UID 0, FDD_LTE (0); Frequency: 711 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 711 \text{ MHz}$; $\sigma = 0.829 \text{ S/m}$; $\epsilon_r = 43.316$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 - SN3798; ConvF(9.78, 9.78, 9.78); Calibrated: 2021/05/31;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1245; Calibrated: 2021/05/19
- Phantom: ELI v4.0; Type: QDOVA001BB; Serial: TP:1102
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Configuration/Body/Area Scan (61x101x1): Interpolated grid: $dx=1.500 \text{ mm}$, $dy=1.500 \text{ mm}$

Maximum value of SAR (interpolated) = 0.877 W/kg

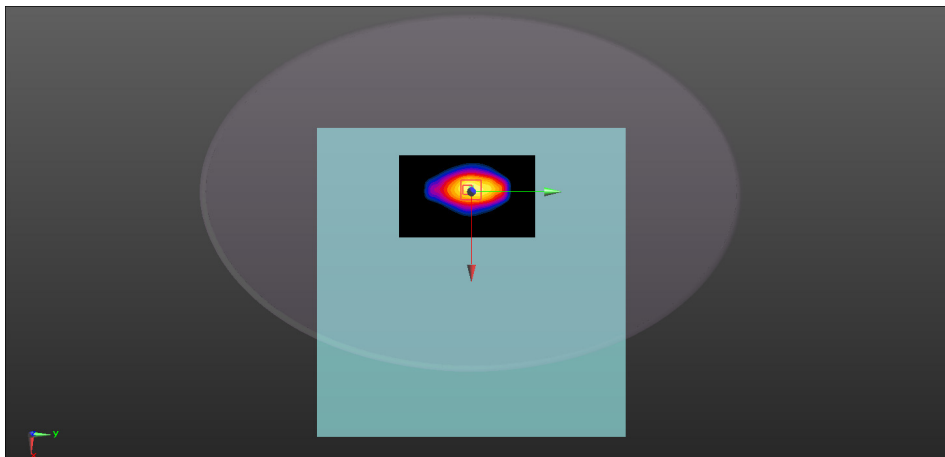
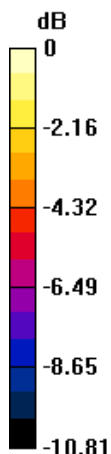
Configuration/Body/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 35.11 V/m ; Power Drift = -0.18 dB

Peak SAR (extrapolated) = 1.23 W/kg

SAR(1 g) = 0.710 W/kg ; SAR(10 g) = 0.426 W/kg

Maximum value of SAR (measured) = 1.06 W/kg



0 dB = 1.06 W/kg = 0.25 dBW/kg



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Test Laboratory: Compliance Certification Services (Kunshan) Inc.

LTE CatM1 Band 13 10M QPSK 1RB2 Back side 0mm Ch23230

DUT: Cellular Body Scale; Type: GBS-2104-G

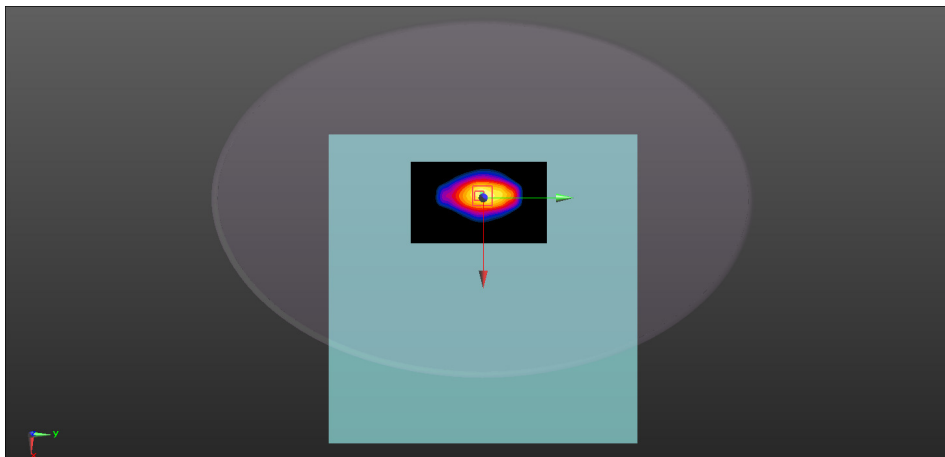
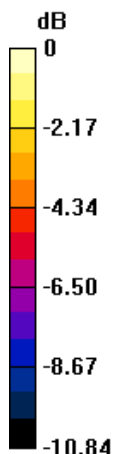
Communication System: UID 0, FDD_LTE (0); Frequency: 782 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 782 \text{ MHz}$; $\sigma = 0.911 \text{ S/m}$; $\epsilon_r = 42.087$; $\rho = 1000 \text{ kg/m}^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 - SN3798; ConvF(9.78, 9.78, 9.78); Calibrated: 2021/05/31;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1245; Calibrated: 2021/05/19
- Phantom: ELI v4.0; Type: QDOVA001BB; Serial: TP:1102
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Configuration/Body/Area Scan (61x101x1): Interpolated grid: $dx=1.500 \text{ mm}$, $dy=1.500 \text{ mm}$
Maximum value of SAR (interpolated) = 0.985 W/kg

Configuration/Body/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$
Reference Value = 35.52 V/m ; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 1.38 W/kg
SAR(1 g) = 0.798 W/kg ; SAR(10 g) = 0.479 W/kg
Maximum value of SAR (measured) = 1.20 W/kg



0 dB = 1.20 W/kg = 0.79 dBW/kg



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Test Laboratory: Compliance Certification Services (Kunshan) Inc.

LTE CatM1 Band 25 20M QPSK 1RB2 Back side 0mm Ch26365

DUT: Cellular Body Scale; Type: GBS-2104-G

Communication System: UID 0, FDD_LTE (0); Frequency: 1882.5 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 1882.5$ MHz; $\sigma = 1.362$ S/m; $\epsilon_r = 40.623$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 - SN3798; ConvF(7.89, 7.89, 7.89); Calibrated: 2021/05/31;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1245; Calibrated: 2021/05/19
- Phantom: ELI v4.0; Type: QDOVA001BB; Serial: TP:1102
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Configuration/Body/Area Scan (61x101x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.533 W/kg

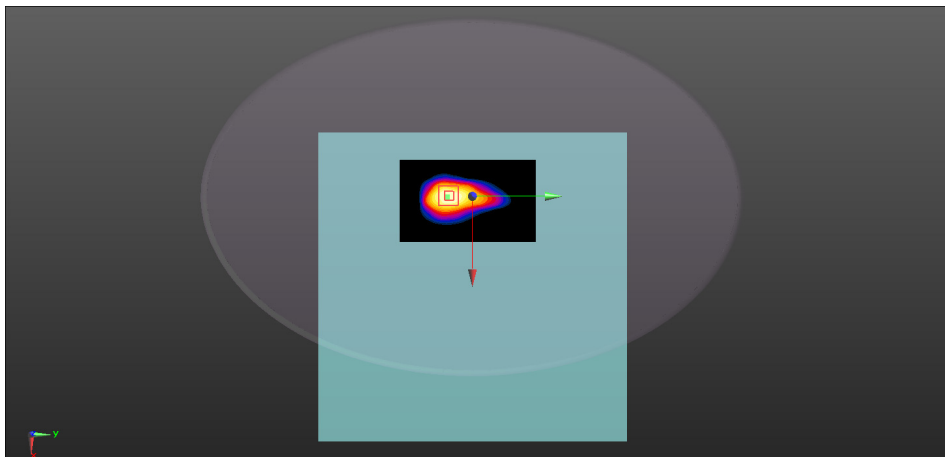
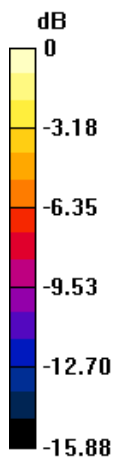
Configuration/Body/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 13.76 V/m; Power Drift = -0.07 dB

Peak SAR (extrapolated) = 0.560 W/kg

SAR(1 g) = 0.328 W/kg; SAR(10 g) = 0.186 W/kg

Maximum value of SAR (measured) = 0.467 W/kg



0 dB = 0.467 W/kg = -3.31 dBW/kg



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Appendix C: Calibration certificate

Appendix D: Photographs

---END---



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