



SAR TEST REPORT

For

GSM GLOBE.COM INC

MOBILE PHONE

Test Model: NOVA

Prepared for : GSM GLOBE.COM INC
Address : 10286 SW 22nd pl. Davie Florida 33324 United States

Prepared by : Shenzhen LCS Compliance Testing Laboratory Ltd.
Address : 101, 201 Bldg A & 301 Bldg C, Juji Industrial Park
Yabianxueziwei, Shajing Street, Baoan District, Shenzhen,
518000, China

Tel : (+86)755-82591330
Fax : (+86)755-82591332
Web : www.LCS-cert.com
Mail : webmaster@LCS-cert.com

Date of receipt of test sample : March 27, 2025
Number of tested samples : 1
Sample number : A250324019-1
Serial number : Prototype
Date of Test : March 27, 2025 ~ April 19, 2025
Date of Report : April 21, 2025



**SAR TEST REPORT**

Report Reference No.: LCSA03265072EB

Date Of Issue : April 21, 2025

Testing Laboratory Name: Shenzhen LCS Compliance Testing Laboratory Ltd.

Address : 101, 201 Bldg A & 301 Bldg C, Juji Industrial Park Yabianxueziwei, Shajing Street, Baoan District, Shenzhen, 518000, China

Testing Location/ Procedure : Full application of Harmonised standards ☒
Partial application of Harmonised standards ☐
Other standard testing method ☐**Applicant's Name : GSM GLOBE.COM INC**

Address : 10286 SW 22nd pl. Davie Florida 33324 United States

Test Specification:

Standard: FCC 47CFR §2.1093, ANSI/IEEE C95.1-2019, IEEE 1528-2013

Test Report Form No.: TRF-4-E-102 A/0

TRF Originator: Shenzhen LCS Compliance Testing Laboratory Ltd.

Master TRF : Dated 2014-09

Shenzhen LCS Compliance Testing Laboratory Ltd. All rights reserved.

This publication may be reproduced in whole or in part for non-commercial purposes as long as the Shenzhen LCS Compliance Testing Laboratory Ltd. is acknowledged as copyright owner and source of the material. Shenzhen LCS Compliance Testing Laboratory Ltd. takes no responsibility for and will not assume liability for damages resulting from the reader's interpretation of the reproduced material due to its placement and context.

Test Item Description: MOBILE PHONE

Trade Mark : RAYO MOVIL

Model/Type Reference : NOVA

Ratings : Input: DC 5.0V, 500mA
For AC Adapter Input: AC 110-240V, 50/60Hz, 0.12A
Adapter Output: DC 5.0V, 500mA
DC 3.7V by Rechargeable Li-ion Battery, 1000mAh**Result : Positive****Compiled by:**

Jay Zhan

Jay Zhan/ File administrators

Supervised by:

Jack Liu

Jack Liu / Technique principal

Approved by:

Gavin Liang

Gavin Liang/ Manager





SAR -- TEST REPORT

Test Report No. :	LCSA03265072EB	<u>April 21, 2025</u> Date of issue
EUT..... : MOBILE PHONE		
Type/Model : NOVA		
Applicant..... : GSM GLOBE.COM INC Address..... : 10286 SW 22nd pl. Davie Florida 33324 United States Telephone..... : / Fax..... : /		
Manufacturer..... : GSM GLOBE.COM INC Address..... : 10286 SW 22nd pl. Davie Florida 33324 United States Telephone..... : / Fax..... : /		
Factory..... : / Address..... : / Telephone..... : / Fax..... : /		

Test Result	Positive
--------------------	-----------------

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.





Revision History

Revision	Issue Date	Revision Content	Revised By
000	April 21, 2025	Initial Issue	---





TABLE OF CONTENTS

1. TEST STANDARDS AND TEST DESCRIPTION.....	6
1.1. STATEMENT OF COMPLIANCE	6
1.2. TEST LOCATION.....	7
1.3. TEST FACILITY.....	7
1.4. TEST LABORATORY ENVIRONMENT	7
1.5. PRODUCT DESCRIPTION	8
1.6. DUT ANTENNA LOCATIONS	10
1.7. TEST SPECIFICATION.....	11
1.8. RF EXPOSURE LIMITS	12
1.9. EQUIPMENT LIST	13
2. SAR MEASUREMENTS SYSTEM CONFIGURATION	14
2.1. SAR MEASUREMENT SYSTEM	14
2.2. ISOTROPIC E-FIELD PROBE EX3DV4.....	16
2.3. DATA ACQUISITION ELECTRONICS (DAE).....	17
2.4. SAM TWIN PHANTOM	17
2.5. ELI PHANTOM	18
2.6. DEVICE HOLDER FOR TRANSMITTERS.....	19
2.7. MEASUREMENT PROCEDURE	20
3. SAR MEASUREMENT VARIABILITY AND UNCERTAINTY.....	24
3.1. SAR MEASUREMENT VARIABILITY.....	24
3.2. SAR MEASUREMENT UNCERTAINTY	24
4. DESCRIPTION OF TEST POSITION.....	25
4.1. HEAD EXPOSURE CONDITION	25
4.2. BODY EXPOSURE CONDITION	28
4.3. EXTREMITY EXPOSURE CONDITIONS	29
5. SAR SYSTEM VERIFICATION PROCEDURE	30
5.1. TISSUE SIMULATE LIQUID.....	30
5.2. SAR SYSTEM CHECK.....	32
6. SAR MEASUREMENT PROCEDURE	35
6.1. CONDUCTED POWER MEASUREMENT	35
6.2. GSM TEST CONFIGURATION.....	35
6.3. UMTS TEST CONFIGURATION	35
6.4. LTE TEST CONFIGURATION	37
6.5. POWER REDUCTION	37
6.6. POWER DRIFT	37
7. TEST CONDITIONS AND RESULTS.....	38
7.1. CONDUCTED POWER RESULTS.....	38
7.2. STAND-ALONE SAR TEST EVALUATION	57
7.3. SAR MEASUREMENT RESULTS.....	58
MULTIPLE TRANSMITTER EVALUATION.....	66
APPENDIX A: DETAILED SYSTEM CHECK RESULTS	69
APPENDIX B: DETAILED TEST RESULTS	69
APPENDIX C: CALIBRATION CERTIFICATE.....	69
APPENDIX D: PHOTOGRAPHS	69





1. TEST STANDARDS AND TEST DESCRIPTION

1.1. Statement of Compliance

The maximum of results of SAR found during testing for NOVA are follows:

<Highest Reported standalone SAR Summary>

Classment Class	Frequency Band	Head (Report SAR1-g (W/kg))	Body-worn (Report SAR1-g (W/kg))
			(Separation Distance 5mm)
PCE	GSM 850	0.296	0.539
	GSM1900	0.187	0.34
	WCDMA Band II	0.145	0.268
	WCDMA Band V	0.307	0.527
	LTE Band 2	0.114	0.241
	LTE Band 4	0.435	0.484
	LTE Band 5	0.332	0.504
	LTE Band 7	0.414	0.736

Note

1) This device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6 W/kg) specified in FCC 47CFR §2.1093 and ANSI/IEEE C95.1-2019, and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2013.

<Highest Reported simultaneous SAR Summary>

Exposure Position	Classment Class	(Report SAR1-g (W/kg))	Highest Reported Simultaneous Transmission SAR1-g (W/kg)
Body	PCE	0.736	0.803
	DTS	0.067	





1.2. Test Location

Company: Shenzhen LCS Compliance Testing Laboratory Ltd.
Address: 101, 201 Bldg A & 301 Bldg C, Juji Industrial Park Yabianxueziwei, Shajing Street, Baoan District, Shenzhen, 518000, China
Telephone: (86)755-82591330
Fax: (86)755-82591330
Web: www.LCS-cert.com
E-mail: webmaster@LCS-cert.com

1.3. Test Facility

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

Site Description
SAR Lab.

: NVLAP Accreditation Code is 600167-0.
FCC Designation Number is CN5024.
CAB identifier is CN0071.
CNAS Registration Number is L4595.
Test Firm Registration Number: 254912.

1.4. Test Laboratory Environment

Temperature	Min. = 18°C, Max. = 25 °C	Min. = 18°C, Max. = 25 °C
Relative humidity	Min. = 30%, Max. = 70%	
Ground system resistance	< 0.5 Ω	
Atmospheric pressure:	950-1050mbar	
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.		
Temperature		Min. = 30%, Max. = 70%
Relative humidity		
Ground system resistance	< 0.5 Ω	
Atmospheric pressure:	950-1050mbar	
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.		





1.5. Product Description

The **GSM GLOBE.COM INC** 's Model: NOVA or the "EUT" as referred to in this report; more general information as follows, for more details, refer to the user's manual of the EUT.

EUT	: MOBILE PHONE
Test Model	: NOVA
Ratings	: Input: DC 5.0V, 500mA For AC Adapter Input: AC 110-240V, 50/60Hz, 0.12A Adapter Output: DC 5.0V, 500mA DC 3.7V by Rechargeable Li-ion Battery, 1000mAh
Hardware Version	: /
Software Version	: /
Bluetooth	:
Frequency Range	: 2402MHz~2480MHz
Channel Number	: 79 channels for Bluetooth V5.0 (DSS) 40 channels for Bluetooth V5.0 (DTS)
Channel Spacing	: 1MHz for Bluetooth V5.0 (DSS) 2MHz for Bluetooth V5.0 (DTS)
Modulation Type	: GFSK, $\pi/4$ -DQPSK, 8-DPSK for Bluetooth V5.0 (DSS) GFSK for Bluetooth V5.0 (DTS)
Bluetooth Version	: V5.0
Antenna Description	: Internal Antenna, 1.37dBi(Max.)
2G	:
Support Band	: <input checked="" type="checkbox"/> GSM 850 (U.S.-Band) <input checked="" type="checkbox"/> PCS 1900 (U.S.-Band)
Release Version	: R99
GPRS Class	: Class 12
EGPRS Class	: /
Type Of Modulation	: GMSK for GSM/GPRS;
Antenna Description	: Internal Antenna -0.71dBi (max.) For GSM 850 0.81dBi (max.) For PCS 1900
3G	:
Support Band	: <input checked="" type="checkbox"/> WCDMA Band II (U.S.-Band) <input checked="" type="checkbox"/> WCDMA Band V (U.S.-Band)
Release Version	: R9
Type Of Modulation	: QPSK, 16QAM
Antenna Description	: Internal Antenna 0.81dBi (max.) For WCDMA Band II -0.71dBi (max.) For WCDMA Band V
LTE	:
Support Band	: <input checked="" type="checkbox"/> E-UTRA Band 2(U.S.-Band) <input checked="" type="checkbox"/> E-UTRA Band 4(U.S.-Band) <input checked="" type="checkbox"/> E-UTRA Band 5(U.S.-Band)





- ☒ E-UTRA Band 7(U.S.-Band)
- ☒ E-UTRA Band 28(Non U.S.-Band)

LTE Release Version : R13

Type Of Modulation : QPSK/16QAM

Antenna Description : Internal Antenna
0.81dBi (max.) For E-UTRA Band 2
0.92dBi (max.) For E-UTRA Band 4
-0.71dBi (max.) For E-UTRA Band 5
1.12dBi (max.) For E-UTRA Band 7

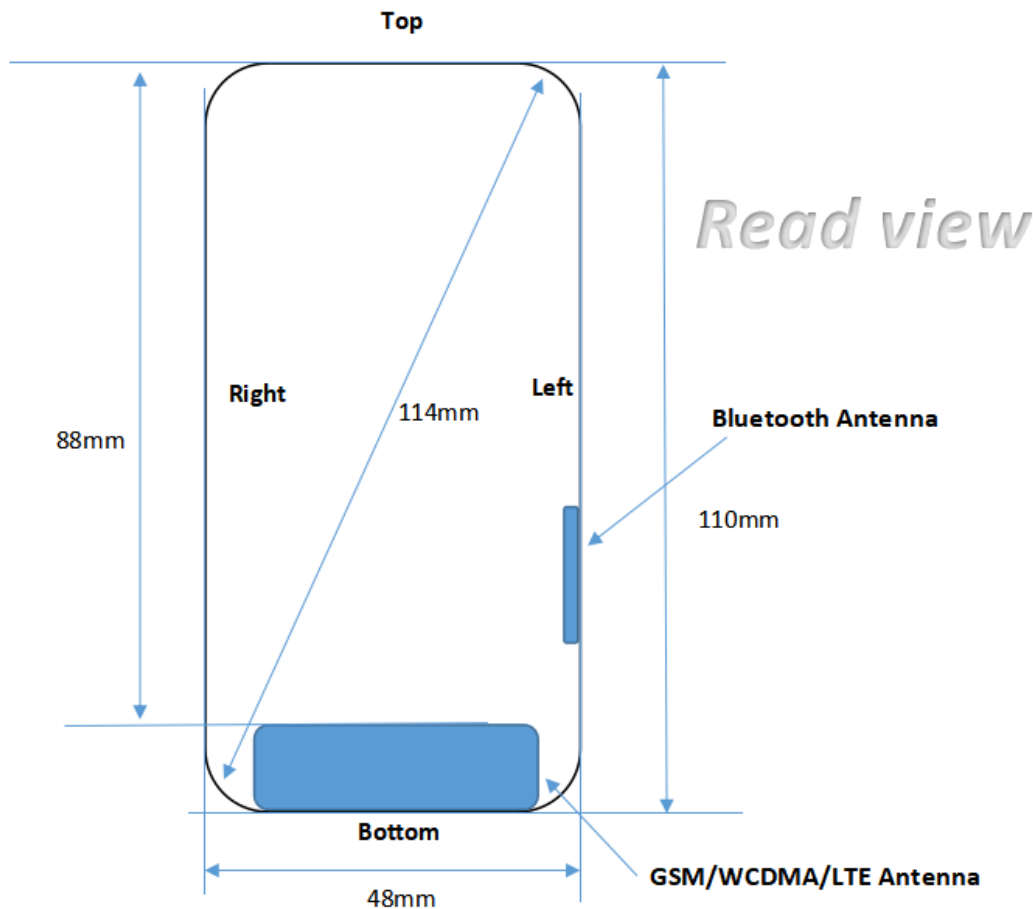
Power Class : Class 3

FM function : Support and only RX

Note: For a more detailed antenna description, please refer to the antenna specifications or the antenna report provided by the customer.



1.6. DUT Antenna Locations



According to the distance between LTE/WCDMA/GSM antennas and the sides of the EUT we can draw the conclusion that:

EUT Sides for SAR Testing							
Mode	Exposure Condition	Front	Back	Left	Right	Top	Bottom
GSM/WCDMA/LTE Antenna	Body 1g SAR	Yes	Yes	Yes	Yes	No	Yes

Table 1: EUT Sides for SAR Testing





1.7. Test Specification

Identity	Document Title
FCC 47CFR §2.1093	Radiofrequency Radiation Exposure Evaluation: Portable Devices
ANSI/IEEE C95.1-2019	IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz – 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
KDB 941225 D01	3G SAR Measurement Procedures v03r01
KDB 941225 D05	SAR for LTE Devices v02r05
KDB 648474 D04	Handset SAR v01r03
KDB 447498 D01	General RF Exposure Guidance v06
KDB 865664 D01	SAR Measurement 100 MHz to 6 GHz v01r04
KDB 865664 D02	RF Exposure Reporting v01r02
KDB 690783 D01	SAR Listings on Grants v01r03





1.8. RF exposure limits

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

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.)





1.9. Equipment list

Test Platform		SPEAG DASY5 Professional				
Description		SAR Test System (Frequency range 300MHz-6GHz)				
Software Reference		DASY52; SEMCAD X				
Hardware Reference						
Equipment		Manufacturer	Model	Serial Number	Calibration Date	Due date of calibration
<input checked="" type="checkbox"/>	PC	Lenovo	NA	NA	NA ¹	NA ¹
<input checked="" type="checkbox"/>	Twin Phantom	SPEAG	SAM V5.0	1850	NA ¹	NA ¹
<input checked="" type="checkbox"/>	ELI Phantom	SPEAG	ELI V6.0	2010	NA ¹	NA ¹
<input checked="" type="checkbox"/>	DAE	SPEAG	DAE3	373	2025/2/17	2026/2/16
<input checked="" type="checkbox"/>	E-Field Probe	SPEAG	EX3DV4	3805	2025/2/25	2026/2/24
<input checked="" type="checkbox"/>	Validation Kits	SPEAG	D835V2	4d124	2023/10/24	2026/10/23
<input checked="" type="checkbox"/>	Validation Kits	SPEAG	D1750V2	1035	2023/6/12	2026/6/11
<input checked="" type="checkbox"/>	Validation Kits	SPEAG	D1900V2	5d055	2023/10/20	2026/10/19
<input checked="" type="checkbox"/>	Validation Kits	SPEAG	D2600V2	1071	2023/6/20	2026/6/19
<input checked="" type="checkbox"/>	Agilent Network Analyzer	Agilent	8753E	SU38432944	2024/6/6	2025/6/5
<input checked="" type="checkbox"/>	Dielectric Probe Kit	SPEAG	DAK3.5	1425	2024/10/8	2025/10/7
<input checked="" type="checkbox"/>	Universal Radio Communication Tester	R&S	CMW500	42115	2024/10/8	2025/10/7
<input checked="" type="checkbox"/>	Directional Coupler	MCLI/USA	4426-20	03746	2024/6/6	2025/6/5
<input checked="" type="checkbox"/>	Power meter	Agilent	E4419B	MY45104493	2024/10/8	2025/10/7
<input checked="" type="checkbox"/>	Power meter	Agilent	E4419B	MY45100308	2024/10/8	2025/10/7
<input checked="" type="checkbox"/>	Power sensor	Agilent	E9301H	MY41495616	2024/10/8	2025/10/7
<input checked="" type="checkbox"/>	Power sensor	Agilent	E9301H	MY41495234	2024/10/8	2025/10/7
<input checked="" type="checkbox"/>	3dB Attenuator	NA	2N-3dB	NA	2024/10/8	2025/10/7
<input checked="" type="checkbox"/>	3dB Attenuator	NA	2N-3dB	NA	2024/10/8	2025/10/7
<input checked="" type="checkbox"/>	3dB Attenuator	NA	2N-3dB	NA	2024/10/8	2025/10/7
<input checked="" type="checkbox"/>	Signal Generator	Agilent	E4438C	MY49072627	2024/6/6	2025/6/5
<input checked="" type="checkbox"/>	Broadband Preamplifier	/	BP-01M18G	P190501	2024/6/6	2025/6/5
<input checked="" type="checkbox"/>	DC POWER SUPPLY	I-SHENG	SP-504	NA	2024/6/6	2025/6/5
<input checked="" type="checkbox"/>	Speed reading thermometer	HTC-1	NA	LCS-E-138	2024/6/6	2025/6/5

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

“1” : NA as this is not measurement equipment.



2. SAR MEASUREMENTS SYSTEM CONFIGURATION

2.1. 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.

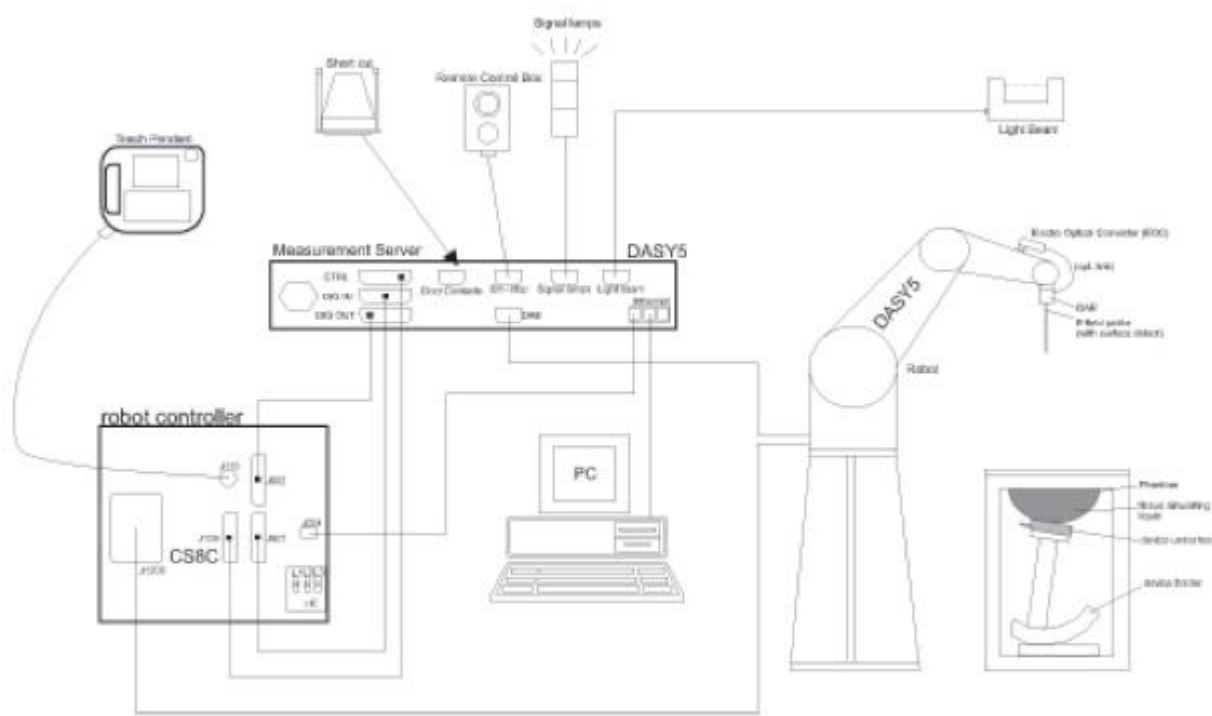
The DASY5 system for performing compliance tests consists of the following items:

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.



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 validating the proper functioning of the system.

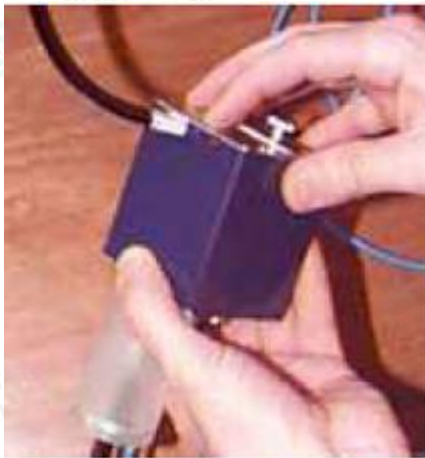


2.2. Isotropic E-field Probe EX3DV4


	<p>Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)</p>
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



2.3. Data Acquisition Electronics (DAE)

Model	DAE	
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	

2.4. 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 IEC-IEEE 62209-1528. 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.



2.5. 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.



2.6. 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.



2.7. Measurement procedure

2.7.1. Full SAR testing 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 32mm*32mm*30mm ($f \leq 2\text{GHz}$), 30mm*30mm*30mm (f for 2-3GHz) and 24mm*24mm*22mm (f for 5-6GHz) was assessed by measuring 5x5x7 points ($f \leq 2\text{GHz}$), 7x7x7 points (f for 2-3GHz) and 7x7x12 points (f for 5-6GHz). 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.





		≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface		5 ± 1 mm	$\frac{1}{2} \cdot \delta \cdot \ln(2) \pm 0.5$ 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: 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 \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: Δx_{Zoom} , Δy_{Zoom}		≤ 2 GHz: ≤ 8 mm 2 – 3 GHz: ≤ 5 mm*	3 – 4 GHz: ≤ 5 mm* 4 – 6 GHz: ≤ 4 mm*
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{Zoom}(n)$		3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm
	graded grid	$\Delta z_{Zoom}(1)$: between 1 st two points closest to phantom surface	3 – 4 GHz: ≤ 3 mm 4 – 5 GHz: ≤ 2.5 mm 5 – 6 GHz: ≤ 2 mm
		$\Delta z_{Zoom}(n>1)$: between subsequent points	$\leq 1.5 \cdot \Delta z_{Zoom}(n-1)$
Minimum zoom scan volume	x, y, z		3 – 4 GHz: ≥ 28 mm 4 – 5 GHz: ≥ 25 mm 5 – 6 GHz: ≥ 22 mm

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. $\pm 5\%$

2.7.2. 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 “.DAE4”. 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.





2.7.3. 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:

$$V_i = U_i + U_i^2 \cdot cf / dcpi$$

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)

dcpi = diode compression point (DASY parameter)

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

E-field probes:

$$E_i = (V_i / Normi \cdot ConvF)^{1/2}$$





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 ($i = x, y, z$)

Normi = 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):

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

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

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

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.

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

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



Shenzhen LCS Compliance Testing Laboratory Ltd.

Add: 101, 201 Bldg A & 301 Bldg C, Juji Industrial Park Yabianxueziwei, Shajing Street, Baoan District, Shenzhen, 518000, China

Tel: +(86) 0755-82591330 | E-mail: webmaster@lcs-cert.com | Web: www.lcs-cert.com

Scan code to check authenticity



3. SAR measurement variability and uncertainty

3.1. 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 (~ 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.

3.2. 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.



Shenzhen LCS Compliance Testing Laboratory Ltd.

Add: 101, 201 Bldg A & 301 Bldg C, Juji Industrial Park Yabianxueziwei, Shajing Street, Baoan District, Shenzhen, 518000, China

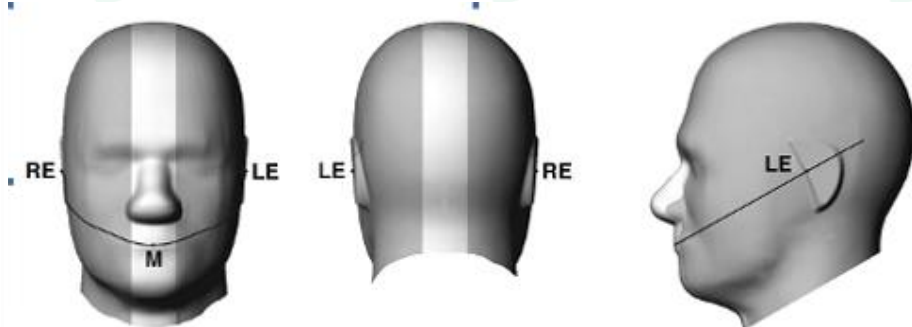
Tel: +(86) 0755-82591330 | E-mail: webmaster@lcs-cert.com | Web: www.lcs-cert.com

Scan code to check authenticity

4. Description of Test Position

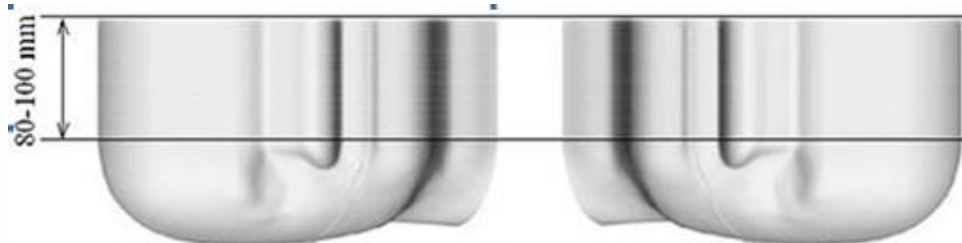
4.1. Head Exposure Condition

4.1.1. SAM Phantom Shape

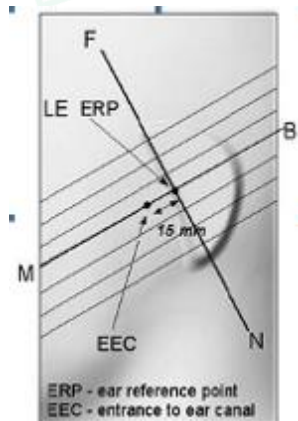


F-3. Front, back, and side views of SAM (model for the phantom shell). Full-head model is for illustration purposes only—procedures in this recommended practice are intended primarily for the phantom setup.

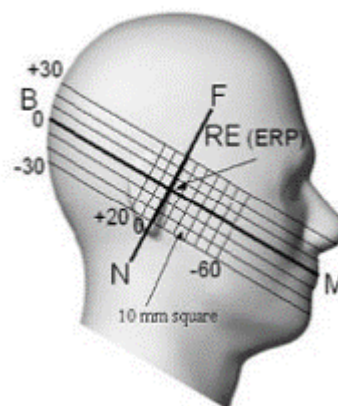
Note: The centre strip including the nose region has a different thickness tolerance.



F-4. Sagittally bisected phantom with extended perimeter (shown placed on its side as used for SAR measurements)



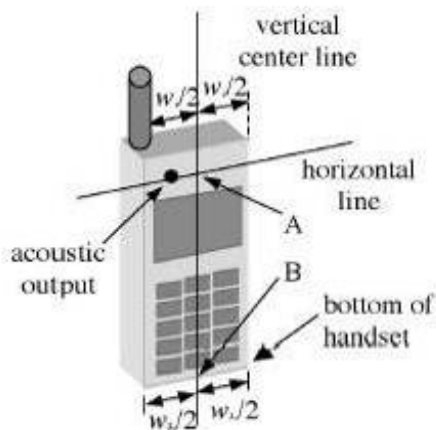
F-5. Close-up side view of phantom, showing the ear region, N-F and B-M lines, and seven cross-sectional plane locations



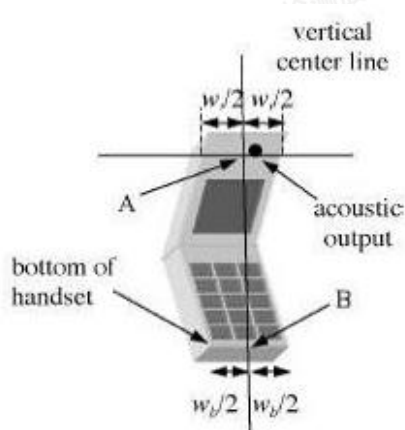
F-6. Side view of the phantom showing relevant markings and seven cross-sectional plane locations



4.1.2. EUT constructions



F-1. Handset vertical and horizontal reference lines—"fixed case"



F-2. Handset vertical and horizontal reference lines—"clam-shell case"

4.1.3. Definition of the "cheek" position

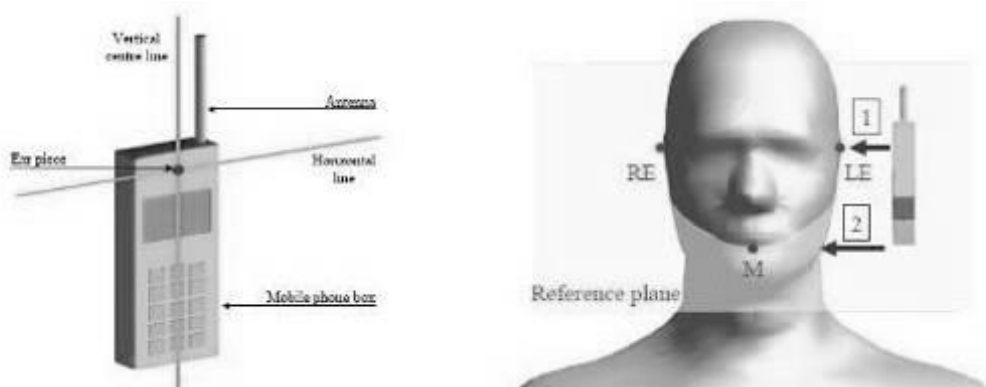
a) Position the device with the vertical centre line of the body of the device and the horizontal line crossing the centre of the ear piece in a plane parallel to the sagittal plane of the phantom ("initial position"). While maintaining the device in this plane, align the vertical centre line with the reference plane containing the three ear and mouth reference points (M, RE and LE) and align the centre of the ear piece with the line RE-LE.

b) Translate the mobile phone box towards the phantom with the ear piece aligned with the line LE-RE until telephone touches the ear. While maintaining the device in the reference plane and maintaining the phone contact with the ear, move the bottom of the box until any point on the front side is in contact with the cheek of the phantom or until contact with the ear is lost.

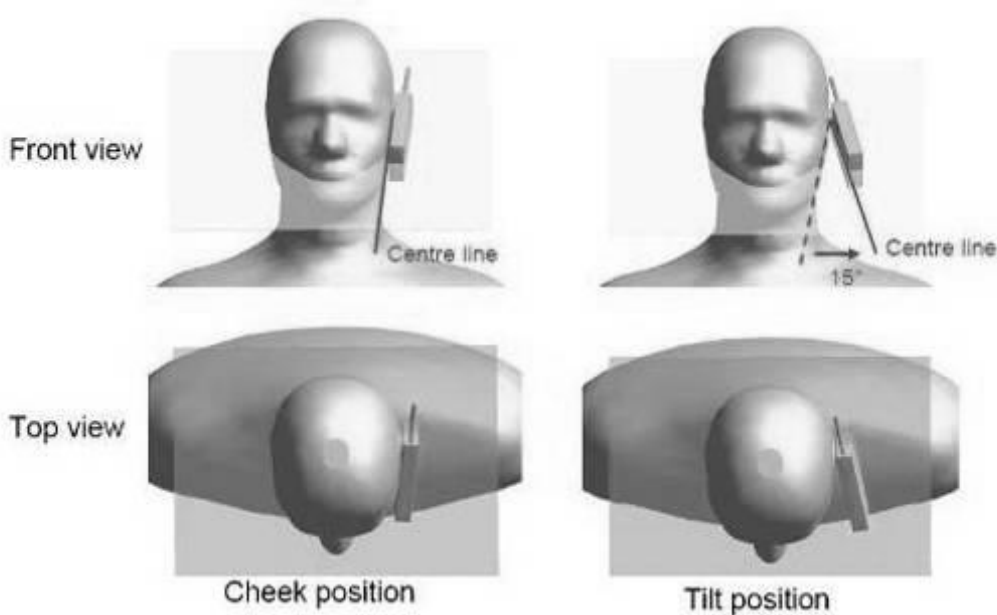


4.1.4. Definition of the “tilted” position

- Position the device in the “cheek” position described above;
- While maintaining the device in the reference plane described above and pivoting against the ear, move it outward away from the mouth by an angle of 15 degrees or until contact with the ear is lost.



F-1. Definition of the reference lines and points, on the phone and on the phantom and initial position



F-2. “Cheek” and “tilt” positions of the mobile phone on the left side



4.2. Body Exposure Condition

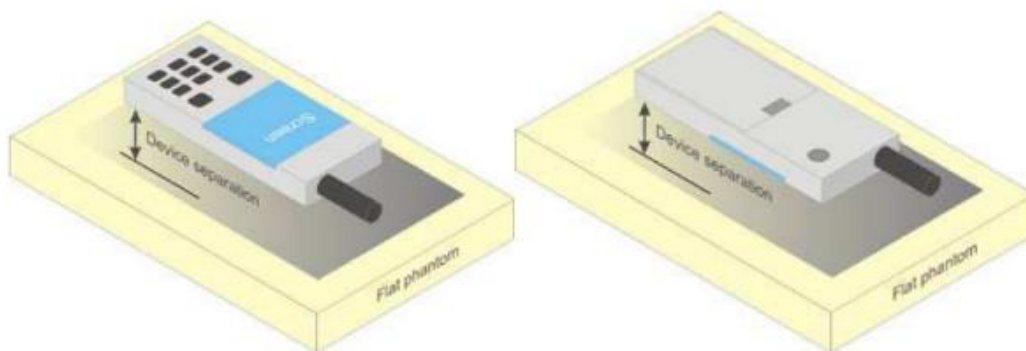
4.2.1. Body-worn accessory exposure conditions

Body-worn operating configurations should be tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in normal use configurations.

Body-worn operating configurations are tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in a normal use configuration. Per FCC KDB Publication 648474 D04, Body-worn accessory exposure is typically related to voice mode operations when handsets are carried in body-worn accessories. The body-worn accessory procedures in FCC KDB Publication 447498 D01 should be used to test for body-worn accessory SAR compliance, without a headset connected to it. This enables the test results for such configuration to be compatible with that required for hotspot mode when the body-worn accessory test separation distance is greater than or equal to that required for hotspot mode, when applicable. When the reported SAR for a body-worn accessory, measured without a headset connected to the handset, is > 1.2 W/kg, the highest reported SAR configuration for that wireless mode and frequency band should be repeated for that body-worn accessory with a headset attached to the handset.

Accessories for Body-worn operation configurations are divided into two categories: those that do not contain metallic components and those that do contain metallic components. When multiple accessories that do not contain metallic components are supplied with the device, the device is tested with only the accessory that dictates the closest spacing to the body. Then multiple accessories that contain metallic components are tested with the device with each accessory. If multiple accessories share an identical metallic component (i.e. the same metallic belt-clip used with different holsters with no other metallic components) only the accessory that dictates the closest spacing to the body is tested.

Body-worn accessories may not always be supplied or available as options for some devices intended to be authorized for body-worn use. In this case, a test configuration with a separation distance between the back of the device and the flat phantom is used. Test position spacing was documented. Transmitters that are designed to operate in front of a person's face, as in push-to-talk configurations, are tested for SAR compliance with the front of the device positioned to face the flat phantom in head fluid. For devices that are carried next to the body such as a shoulder, waist or chest-worn transmitters, SAR compliance is tested with the accessories, including headsets and microphones, attached to the device and positioned against a flat phantom in a normal use configuration.



F-1. Test positions for body-worn devices

