SAR TEST REPORT

For

WellCare Today, LLC

Smart Watch

Model No.: S1

Prepared for	:	WellCare Today, LLC
Address	:	75 Lane Road Suite 404 Fairfield, NJ. 07004, United States

Prepared by	:	Shenzhen LCS Compliance Testing Laboratory Ltd.
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Date of receipt of test sample	:	September 07, 2016
Number of tested samples	:	1
Serial number	:	Prototype
Date of Test	:	September 08, 2016~September 09, 2016
Date of Report	:	September 14, 2016

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SAR TEST REPORT

Report Reference No.................:	**LCS1609070432E**
Date Of Issue................................:	September 09, 2016
Testing Laboratory Name ....:	**Shenzhen LCS Compliance Testing Laboratory Ltd.**
Address...:	1/F., Xingyuan Industrial Park, Tongda Road, Bao'an Avenue, Bao'an District, Shenzhen, Guangdong, China
Testing Location/ Procedure ....:	Full application of Harmonised standards ■ Partial application of Harmonised standards □ Other standard testing method □
Applicant's Name ....:	**WellCare Today, LLC**
Address...:	75 Lane Road Suite 404 Fairfield, NJ. 07004, United States
Test Specification:	
Standard ....:	IEEE 1528:2013/KDB865664 47CFR §2.1093
Test Report Form No. ....:	LCSEMC-1.0
TRF Originator.............................:	Shenzhen LCS Compliance Testing Laboratory Ltd.
Master TRF ....:	Dated 2014-09

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Test Item Description................:	**Smart Watch**
Trade Mark...................................:	N/A
Model/Type Reference................:	S1
Operation Frequency...................:	GSM 850/PCS1900, Bluetooth3.0
Modulation Type..........................:	GSM(GMSK,8PSK), Bluetooth(GFSK)
Ratings ....:	DC 3.7V by battery(1.406Wh) Recharge Voltage: DC 5V/1A
Result ....:	**Positive**

Compiled by:	**Supervised by:**	**Approved by:**
Linda He		Gavin Liang
Linda He/ File administrators	Glin Lu/ Technique principal	Gavin Liang/ Manager

SAR -- TEST REPORT

Test Report No. :	**LCS1609070432E**	September 09, 2016 Date of issue

Type / Model.........................	:	S1
EUT.......................................	:	Smart Watch
Applicant..............................	**:**	**WellCare Today, LLC**
Address..................................	:	75 Lane Road Suite 404 Fairfield, NJ. 07004, United States
Telephone..............................	:	/
Fax...	:	/
Manufacturer.......................	**:**	**Shenzhen NJY Science & Technology Co., Ltd**
Address..................................	:	No 5 Songpingshan Road,#202JiaDa R&D Bulding Lobby B ShenZhen, 518057 China
Telephone..............................	:	/
Fax...	:	/
Factory..................................	**:**	**Shenzhen NJY Science & Technology Co., Ltd**
Address..................................	:	No 5 Songpingshan Road,#202JiaDa R&D Bulding Lobby B ShenZhen, 518057 China
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.

Revison History

Revision	Issue Date	Revisions	Revised By
00	2016-09-14	Initial Issue	Gavin Liang

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1.TEST STANDARDS AND TEST DESCRIPTION

1.1. Test Standards

IEEE Std C95.1, 2005: IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 KHz to 300 GHz. It specifies the maximum exposure limit of 1.6 W/kg as averaged over any 1 gram of tissue for portable devices being used within 20 cm of the user in the uncontrolled environment.
IEEE Std 1528™-2013: IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques.
FCC Part 2.1093 Radiofrequency Radiation Exposure Evaluation:Portable Devices
KDB447498 D01 General RF Exposure Guidance v06 : Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies
KDB648474 D04, Handset SAR v01r03: SAR Evaluation Considerations for Wireless Handsets
KDB865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04 : SAR Measurement Requirements for 100 MHz to 6 GHz
KDB865664 D02 RF Exposure Reporting v01r02: RF Exposure Compliance Reporting and Documentation Considerations
KDB941225 D01 3G SAR Procedures v03r01: 3G SAR MEAUREMENT PROCEDURES

1.2. Test Description

The EUT battery must be fully charged and checked periodically during the test to ascertain uniform power .
And Test device is identical prototype.

1.3. General Remarks

Date of receipt of test sample	:	September 07, 2016
Testing commenced on	:	September 08, 2016
Testing concluded on	:	September 09, 2016

1.4. Product Description

The **WellCare Today, LLC's** Model: S1 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.

General Description	
Product Name:	Smart Watch
Trade Mark:	N/A
Model/Type reference:	S1
Listed Model(s):	N/A
Modulation Type:	GSM(GMSK), Bluetooth(GFSK, π/4-DQPSK, 8DPSK)
Device category:	Portable Device
Exposure category:	General population/uncontrolled environment
EUT Type:	Prototype
Hardware Version	R61S V2.1
Software Version:	R61S_V2.1_W126_128_LANGB_20160428
Power supply:	DC 3.7V by battery(1.406Wh) Recharge Voltage: DC 5V/1A
The EUT is GSM, Smart Watch. the Smart Watch is intended for speech and Multimedia Message Service (MMS) transmission. It is equipped with GPRS/EDGE class 12 for GSM850, PCS1900, and Bluetooth functions. For more information see the following datasheet	

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Technical Characteristics	
GSM	
Support Networks	GSM, GPRS, EGPRS
Support Band	GSM850, PCS1900
Frequency	GSM850: 824.2~848.8MHz GSM1900: 1850.2~1909.8MHz
Power Class:	GSM850:Power Class 5 PCS1900:Power Class 0
Modulation Type:	GMSK for GSM/GPRS/ EGPRS
GSM Release Version	R99
GPRS Multislot Class	12
EGPRS Multislot Class	12
DTM Mode	Not Supported
Antenna Description	PIFA Antenna, -0.8dBi(Max.) for GSM850; -0.7 dBi(Max.) for GSM1900
Bluetooth	
Bluetooth Version:	V3.0
Modulation:	GFSK(1Mbps), π/4-DQPSK(2Mbps), 8DPSK(3Mbps)
Operation frequency:	2402MHz~2480MHz
Channel number:	79
Channel separation:	1MHz
Antenna Description	PIFA Antenna, 1.1dBi(Max.)

1.5. Statement of Compliance

The maximum of results of SAR found during testing for S1 are follows:

<Highest Reported standalone SAR Summary>

***Next – to – Mouth Exposure Conditions* - Flat / Front (10mm)**

Classment Class	Frequency Band	Highest Measured SAR_{1-g} (W/Kg)	SAR_{1-g} Limit
PCF	GSM850	**0.217**	1.6
	PCS1900	0.056	

Extremity Exposure Conditions - Flat / Rear (0mm)

Classment Class	Frequency Band	Highest Measured SAR_{10-g} (W/Kg)	SAR_{10-g} Limit
PCF	GSM850	**1.938**	4.0
	PCS1900	0.448	

This device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6 W/kg for 1g) for Next – to Mouth Exousre – Flat/Front (10mm) and Extremity Exposure limit (4.0W/Kg for 10g) specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-2005, and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2013.
The EUT battery must be fully charged and checked periodically during the test to ascertain iniform power output

<Highest Reported simultaneous SAR Summary>

***Next – to – Mouth Exposure Conditions* - Flat / Front (10mm)**

Exposure Position	Frequency Band	Reported SAR_{1-g} (W/kg)	Classment Class	Highest Reported Simultaneous Transmission SAR_{1-g} (W/Kg)
Next – to - Mouth	GSM850	**0.217**	PCF	**0.250**
	BT	0.033	DSS	

Extremity Exposure Conditions - Flat / Rear (0mm)

Exposure Position	Frequency Band	Reported $SAR_{10\text{-}g}$ (W/kg)	Classment Class	Highest Reported Simultaneous Transmission $SAR_{10\text{-}g}$ (W/Kg)
Extremity Exposure	GSM850	1.938	PCF	2.004
	BT	0.066	DSS	

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2.TEST ENVIRONMENT

2.1. Test Facility

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

Site Description

EMC Lab. : CNAS Registration Number. is L4595.
FCC Registration Number. is 899208.
Industry Canada Registration Number. is 9642A-1.
VCCI Registration Number. is C-4260 and R-3804.
ESMD Registration Number. is ARCB0108.
UL Registration Number. is 100571-492.
TUV SUD Registration Number. is SCN1081.
TUV RH Registration Number. is UA 50296516-001.

2.2. Environmental conditions

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

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

2.3. SAR Limits

FCC Limit (1g Tissue)

EXPOSURE LIMITS	SAR (W/kg)	
	(General Population / Uncontrolled Exposure Environment)	(Occupational / Controlled Exposure Environment)
Spatial Average(averaged over the whole body)	0.08	0.4
Spatial Peak(averaged over any 1 g of tissue)	1.6	8.0
Spatial Peak(hands/wrists/ feet/anklesaveraged over 10 g)	4.0	20.0

Population/Uncontrolled Environments are defined as locations where there is the exposure of individual who have no knowledge or control of their exposure.
Occupational/Controlled Environments are defined as locations where there is exposure that may be incurred by people who are aware of the potential for exposure (i.e. as a result of employment or occupation).

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2.4. Equipments Used during the Test

Test Equipment	Manufacturer	Type/Model	Serial Number	Calibration	
				Calibration Date	Calibration Due
PC	Lenovo	G5005	MY42081102	N/A	N/A
Signal Generator	Angilent	E4438C	MY42081396	09/25/2015	09/24/2016
Multimeter	Keithley	MiltiMeter 2000	4059164	10/01/2015	09/30/2016
S-parameter Network Analyzer	Agilent	8753ES	US38432944	09/25/2015	09/24/2016
Wireless Communication Test Set	R & S	CMU200	105988	09/25/2015	09/24/2016
Power Meter	R & S	NRVS	100469	09/25/2015	09/24/2016
Power Sensor	R & S	NRV-Z51	100458	06/18/2016	06/17/2017
Power Sensor	R & S	NRV-Z32	10057	06/18/2016	06/17/2017
E-Field PROBE	SATIMO	SSE5	SN 17/14 EP220	10/01/2015	09/30/2016
E-Field PROBE	SATIMO	SSE5	SN 17/14 EP221	09/01/2016	08/31/2017
DIPOLE 835	SATIMO	SID 835	SN 07/14 DIP 0G835-303	10/01/2015	09/30/2016
DIPOLE 1900	SATIMO	SID 1900	SN 30/14 DIP 1G900-333	09/01/2016	08/31/2017
COMOSAR OPEN Coaxial Probe	SATIMO	OCPG 68	SN 40/14 OCPG68	10/01/2015	09/30/2016
Communication Antenna	SATIMO	ANTA57	SN 39/14 ANTA57	10/01/2015	09/30/2016
Mobile Phone POSITIONING DEVICE	SATIMO	MSH98	SN 40/14 MSH98	N/A	N/A
DUMMY PROBE	SATIMO	DP60	SN 03/14 DP60	N/A	N/A
SAM PHANTOM	SATIMO	SAM117	SN 40/14 SAM117	N/A	N/A
6 AXIS ROBOT	KUKA	KR6-R900	501217	N/A	N/A
High Power Solid State Amplifier (80MHz~1000MHz)	Instruments for Industry	CMC150	M631-0627	09/25/2015	09/24/2016
Medium Power Solid State Amplifier (0.8~4.2GHz)	Instruments for Industry	S41-25	M629-0539	09/25/2015	09/24/2016

Note:

1) Per KDB865664D01 requirements for dipole calibration, the test laboratory has adopted three year extended calibration interval. Each measured dipole is expected to evalute with following criteria at least on annual interval.

a) There is no physical damage on the dipole;
b) System check with specific dipole is within 10% of calibrated values;
c) The most recent return-loss results,measued at least annually,deviates by no more than 20% from the previous measurement;
d) The most recent measurement of the real or imaginary parts of the impedance, measured at least annually is within 5Ω from the provious measurement.

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

3.SAR MEASUREMENTS SYSTEM CONFIGURATION

3.1. SARMeasurement Set-up

The OPENSAR system for performing compliance tests consist of the following items:

A standard high precision 6-axis robot (KUKA) with controller and software.

KUKA Control Panel (KCP)

A dosimetric probe, i.e., an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with a Video Positioning System(VPS).

The stress sensor is composed with mechanical and electronic when the electronic part detects a change on the electro-mechanical switch,It sends an “Emergency signal” to the robot controller that to stop robot’s moves

A computer operating Windows XP.

OPENSAR software

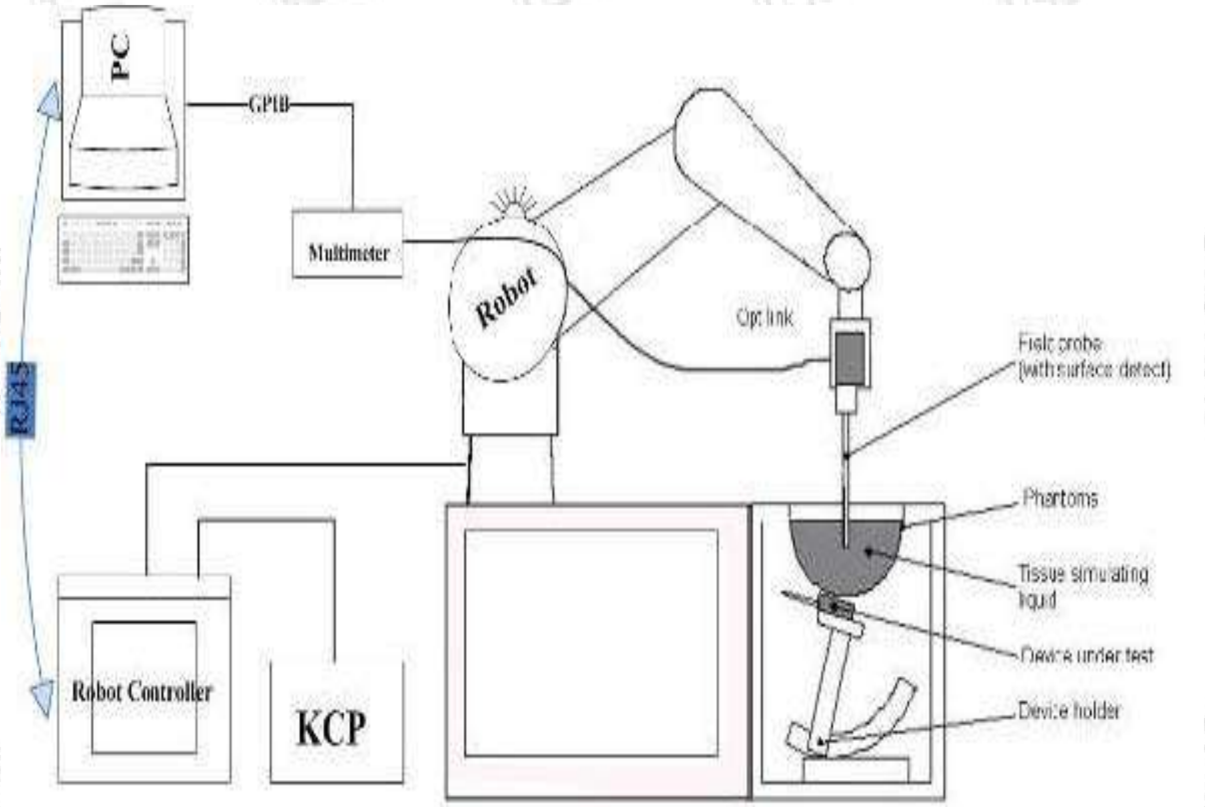
Remote control with teaches pendant and additional circuitry for robot safety such as warning lamps, etc.

The SAM phantom enabling testing left-hand right-hand and body usage.

The Position device for handheld EUT

Tissue simulating liquid mixed according to the given recipes .

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



3.2. OPENSAR E-field Probe System

The SAR measurements were conducted with the dosimetric probe EP220 (manufactured by SATIMO), designed in the classical triangular configuration and optimized for dosimetric evaluation.

Probe Specification

ConstructionSymmetrical design with triangular core
Interleaved sensors
Built-in shielding against static charges
PEEK enclosure material (resistant to organic solvents, e.g., DGBE)

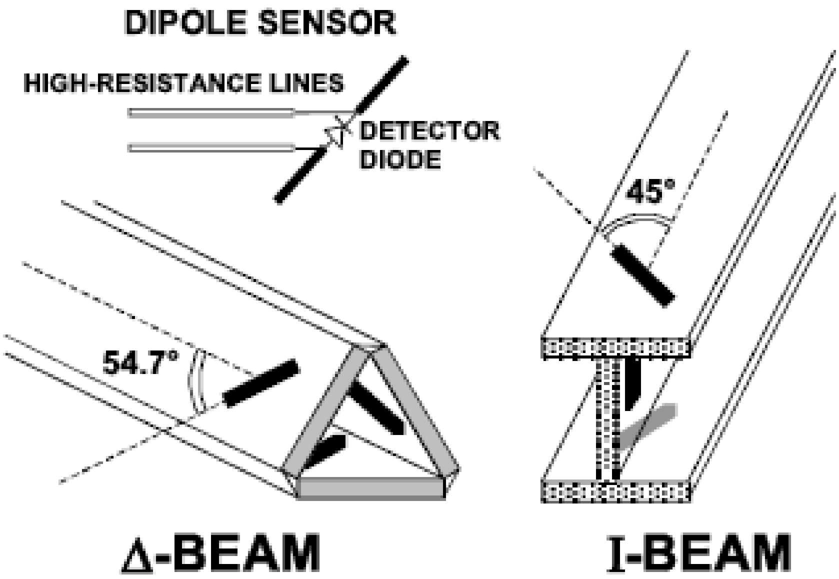
CalibrationISO/IEC 17025 calibration service available.

Frequency	700 MHz to 3 GHz; Linearity:0.25dB(700 MHz to 3GHz)
Directivity	0.25 dB in HSL (rotation around probe axis) 0.5 dB in tissue material (rotation normal to probe axis)
Dynamic Range	0.01W/kg to > 100 W/kg; Linearity: 0.25 dB
Dimensions	Overall length: 330 mm (Tip: 16mm) Tip diameter: 5 mm (Body: 8 mm) Distance from probe tip to sensor centers: 2.5 mm
Application	General dosimetry up to 3 GHz Dosimetry in strong gradient fields Compliance tests of Mobile Phones

Isotropic E-Field Probe

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

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



3.3. Phantoms

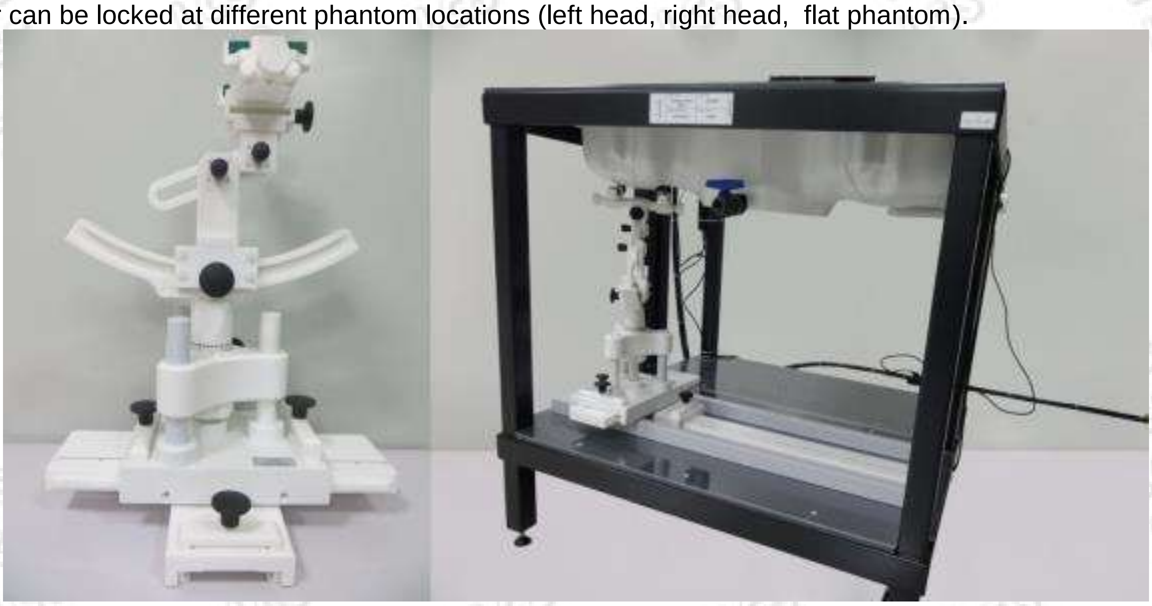
The SAM Phantom SAM117 is constructed of a fiberglass shell ntegrated in a wooden table. The shape of the shell is in compliance with the specification set in IEEE P1528 and CENELEC EN62209-1 , EN62209-2:2010.The phantom enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents the evaporation of the liquid. Reference markings on the Phantom allow the complete setup of allpredefined phantom positions and measurement grids by manually teaching three points in the robo

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

SAM Twin Phantom

3.4. Device Holder

In combination with the Generic Twin PhantomSAM117, the Mounting Device enables the rotation of the mounted transmitter in spherical coordinates whereby the rotation points is the ear opening. The devices can be easily, accurately, and repeatedly positioned according to the FCC and CENELEC specifications. The device holder can be locked at different phantom locations (left head, right head, flat phantom).



Device holder supplied by SATIMO

3.5. Scanning Procedure

The procedure for assessing the peak spatial-average SAR value consists of the following steps

Power Reference Measurement
The reference and drift jobs are useful jobs for monitoring the power drift of the device under test in the batch process. Both jobs measure the field at a specified reference position, at a selectable distance from the phantom surface. The reference position can be either the selected section's grid reference point or a user point in this section. The reference job projects the selected point onto the phantom surface, orients the probe perpendicularly to the surface, and approaches the surface using the selected detection method.

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

	≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface	5 mm ± 1 mm	$\frac{1}{2} \cdot \delta \cdot \ln(2)$ mm ± 0.5 mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location	30° ± 1°	20° ± 1°
Maximum area scan spatial resolution: Δx_{Area}, Δy_{Area}	≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3 – 4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 10 mm
	When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	

Zoom Scan
Zoom Scans are used to estimate the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of simulated tissue. The default Zoom Scan is done by 7x7x7 points within a cube whose base is centered around the maxima found in the preceding area scan.

			≤ 3 GHz	> 3 GHz
Maximum zoom scan spatial resolution: Δx_{Zoom}, Δy_{Zoom}			≤ 2 GHz: ≤ 8 mm 2 – 3 GHz: ≤ 5 mm*	3 – 4 GHz: ≤ 5 mm* 4 – 6 GHz: ≤ 4 mm*
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{Zoom}(n)$		≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm
	graded grid	$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface	≤ 4 mm	3 – 4 GHz: ≤ 3 mm 4 – 5 GHz: ≤ 2.5 mm 5 – 6 GHz: ≤ 2 mm
		$\Delta z_{Zoom}(n>1)$: between subsequent points	$\le 1.5 \cdot \Delta z_{Zoom}(n-1)$ mm	
Minimum zoom scan volume	x, y, z		≥ 30 mm	3 – 4 GHz: ≥ 28 mm 4 – 5 GHz: ≥ 25 mm 5 – 6 GHz: ≥ 22 mm

Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see IEEE Std 1528-2013 for details.

* When zoom scan is required and the *reported* SAR from the *area scan based 1-g SAR estimation* procedures of KDB Publication 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.

Power Drift measurement
The drift job measures the field at the same location as the most recent reference job within the same procedure, and with the same settings. The drift measurement gives the field difference in dB from the reading conducted within the last reference measurement. Several drift measurements are possible for one reference measurement. This allows a user to monitor the power drift of the device under test within a batch process. In the properties of the Drift job, the user can specify a limit for the drift and have OPENSAR software stop the measurements if this limit is exceeded.

3.6. Data Storage and Evaluation

Data Storage
The OPENSAR 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 . The software evaluates the desired unit and format for output each time the data is visualized or exported. This allows verification of the complete software setup even after the measurement and allows correction of incorrect parameter settings. For example, if a measurement has been performed with a wrong crest factor parameter in the device setup, the parameter can be corrected afterwards and the data can be re-evaluated.

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

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

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

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

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

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

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

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

$$\mathrm{E-fieldprobes:} \quad E_i = \sqrt{\frac{V_i}{Norm_i \cdot ConvF}}$$

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

With Vi = 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

aij = sensor sensitivity factors for H-field probes
f = carrier frequency [GHz]
Ei = electric field strength of channel i in V/m
Hi = magnetic field strength of channel i in A/m

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

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

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

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

with SAR = local specific absorption rate in mW/g
Etot = total field strength in V/m
σ = conductivity in [mho/m] or [Siemens/m]
ρ = equivalent tissue density in g/cm3

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

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

Per KDB 447498 Section6.2. Wrist watch and wrist-worn transmitters: Transmitters that are built-in within a wrist watch or similar wrist-worn devices typically operate in speaker mode for voice communication, with the device worn on the wrist and positioned next to the mouth. Next to the mouth exposure requires 1-g SAR and the wrist-worn condition requires 10-g extremity SAR.58 The 10-g extremity and 1-g SAR test exclusions may be applied to the wrist and face exposure conditions. When SAR evaluation is required, next to the mouth use is evaluated with the front of the device positioned at 10 mm from a flat phantom filled with head tissue-equivalent medium. The wrist bands should be strapped together to represent normal use conditions. SAR for wrist exposure is evaluated with the back of the device positioned in direct contact against a flat phantom filled with body tissue-equivalent medium. The wrist bands should be unstrapped and touching the phantom. The space introduced by the watch or wrist bands and the phantom must be representative of actual use conditions; otherwise, if applicable, the neck or a curved head region of the SAM phantom may be used, provided the device positioning and SAR probe access issues have been addressed through a KDB inquiry. When other device positioning and SAR measurement considerations are necessary, a KDB inquiry is also required for the test results to be acceptable; for example, devices with rigid wrist bands or electronic circuitry and/or antenna(s) incorporated in the wrist bands. These test configurations are applicable only to devices that are worn on the wrist and cannot support other use conditions; therefore, the operating restrictions must be fully demonstrated in both the test reports and user manuals.

3.8. Tissue Dielectric Parameters for Head and Body Phantoms

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

The composition of the tissue simulating liquid

Frequency (MHz)	Bactericide	DGBE	HEC	NaCl	Sucrose	1,2-Propanediol	X100	Water	Conductivity	Permittivity
	%	%	%	%	%	%	%	%	σ	εr
750	/	/	/	0.79	/	64.81	/	34.40	0.97	41.8
835	/	/	/	0.79	/	64.81	/	34.40	0.97	41.8
900	/	/	/	0.79	/	64.81	/	34.40	0.97	41.8
1800	/	13.84	/	0.35	/	/	30.45	55.36	1.38	41.0
1900	/	13.84	/	0.35	/	/	30.45	55.36	1.38	41.0
2000	/	7.99	/	0.16	/	/	19.97	71.88	1.55	41.1
2450	/	7.99	/	0.16	/	/	19.97	71.88	1.88	40.3
2600	/	7.99	/	0.16	/	/	19.97	71.88	1.88	40.3

Target Frequency (MHz)	Head		Body	
	ε_r	$\sigma(S/m)$	ε_r	$\sigma(S/m)$
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
2600	39.0	1.96	52.5	2.16
3000	38.5	2.40	52.0	2.73
5800	35.3	5.27	48.2	6.00

3.9. Tissue equivalent liquid properties

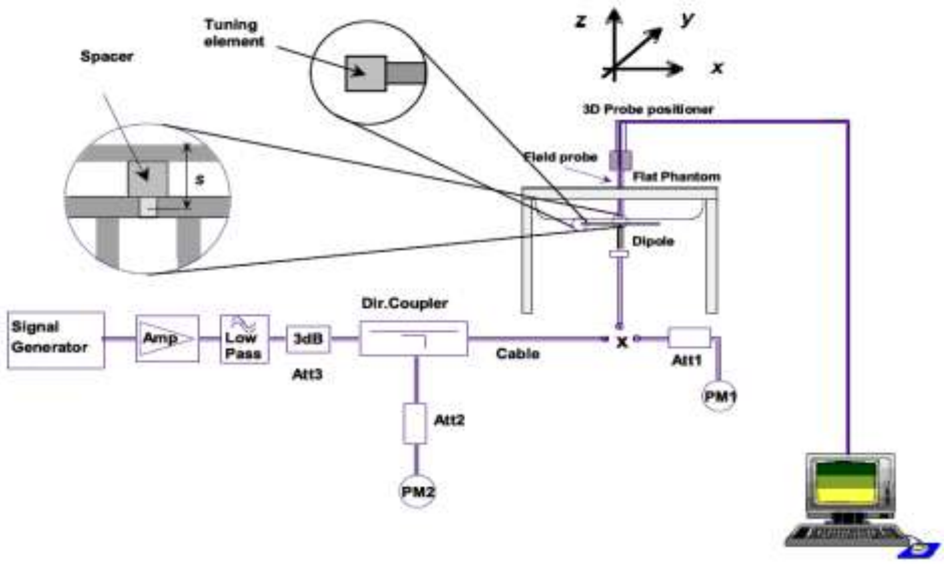
Dielectric Performance of Head and Body Tissue Simulating Liquid

Tissue Type	Measured Frequency (MHz)	Target Tissue		Measured Tissue				Liquid Temp.	Test Data
		ε_r	σ	ε_r	Dev.	σ	Dev.		
835H	835	41.50	0.90	43.22	4.14%	0.93	3.33%	21.5	09/08/2016
1900H	1900	40.00	1.40	41.50	3.75%	1.45	3.57%	21.5	09/09/2016
835B	835	55.20	0.97	57.18	3.59%	0.98	1.03%	21.5	09/08/2016
1900B	1900	53.30	1.52	54.83	2.87%	1.56	2.63%	21.5	09/09/2016

3.10. System Check

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

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



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

Photo of Dipole Setup

Mixture Type	Frequency (MHz)	Power	SAR_{1g} (W/Kg)	SAR_{10g} (W/Kg)	Drift (%)	1W Target		Difference percentage		Liquid Temp	Date
						SAR_{1g} (W/Kg)	SAR_{10g} (W/Kg)	1g	10g		
Head	835	100 mW	0.947	0.605	-1.57	9.60	6.20	-1.35%	-2.42%	21.5	09/08/2016
		Normalize to 1 Watt	9.47	6.05							
Body	835	100 mW	0.980	0.613	0.91	9.90	6.39	-1.01%	-4.07%	21.5	09/08/2016
		Normalize to 1 Watt	9.80	6.13							
Head	1900	100 mW	3.700	1.874	-0.43	39.84	20.20	-7.13%	7.23%	21.5	09/09/2016
		Normalize to 1 Watt	37.00	18.74							
Body	1900	100 mW	3.975	1.945	1.53	43.33	21.59	-8.26%	-9.91%	21.5	09/09/2016
		Normalize to 1 Watt	39.75	19.45							

3.11. SAR measurement procedure

The measurement procedures are as follows:

3.11.1 Conducted power measurement

a. For WWAN power measurement, use base station simulator connection with RF cable, at maximum power in each supported wireless interface and frequency band.
b. Read the WWAN RF power level from the base station simulator.
c. For BT power measurement, use engineering software to configure EUT BT continuously Transmission, at maximum RF power in each supported wireless interface and frequency band.
d. Connect EUT RF port through RF cable to the power meter, and measure BT output power.

3.11.2 GSM Test Configuration

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

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

3.12. Power Reduction

The product without any power reduction.

3.13. Power Drift

To control the output power stability during the SAR test, SAR system calculates the power drift by measuring the E-field at the same location at the beginning and at the end of the measurement for each test position. This ensures that the power drift during one measurement is within 5%.

4.TEST CONDITIONS AND RESULTS

4.1. Conducted Power Results

Max Conducted power measurement results and power drift from tune-up tolerance provide by manufacturer:

Conducted power measurement results for GSM850/PCS1900

GSM 850		Burst Conducted power (dBm) Channel/Frequency(MHz)			/	Average power (dBm) Channel/Frequency(MHz)		
		128/824.2	190/836.6	251/848.8		128/824.2	190/836.6	251/848.8
GSM		33.25	**33.67**	33.02	-9.03dB	24.22	24.64	23.99
GPRS (GMSK)	1TX slot	31.44	31.95	31.31	-9.03dB	22.41	22.92	22.28
	2TX slot	**31.21**	**31.02**	**31.23**	-6.02dB	25.19	25.00	25.21
	3TX slot	31.09	31.06	31.14	-4.26dB	26.83	26.80	26.88
	4TX slot	**31.06**	**31.19**	**31.54**	**-3.01dB**	**28.05**	**28.18**	**28.53**
EGPRS (GMSK)	1TX slot	31.53	31.99	31.30	-9.03dB	22.50	22.96	22.27
	2TX slot	30.98	30.96	30.06	-6.02dB	24.96	24.94	24.04
	3TX slot	30.87	30.69	30.57	-4.26dB	26.61	26.43	26.31
	4TX slot	30.76	30.83	30.59	-3.01dB	27.75	27.82	27.58
GSM 1900		**Burst Conducted power (dBm) Channel/Frequency(MHz)**			**/**	**Average power (dBm) Channel/Frequency(MHz)**		
		512/ 1850.2	**661/ 1880**	**810/ 1909.8**		**512/ 1850.2**	**661/ 1880**	**810/ 1909.8**
GSM		29.60	29.96	29.33	-9.03dB	20.57	20.93	20.30
GPRS (GMSK)	1TX slot	28.64	29.00	29.37	-9.03dB	19.61	19.97	20.34
	2TX slot	28.69	28.34	28.96	-6.02dB	22.67	22.32	22.94
	3TX slot	28.67	28.53	28.66	-4.26dB	24.41	24.27	24.40
	4TX slot	**28.47**	**28.59**	**28.72**	**-3.01dB**	**25.46**	**25.58**	**25.71**
EGPRS (GMSK)	1TX slot	28.67	28.97	28.38	-9.03dB	19.64	19.94	19.35
	2TX slot	28.16	28.24	28.31	-6.02dB	22.14	22.22	22.29
	3TX slot	28.46	28.51	28.44	-4.26dB	24.20	24.25	24.18
	4TX slot	28.39	28.20	28.42	-3.01dB	25.38	25.19	25.41

Notes:

1. Division Factors

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

1TX-slot = 1 transmit time slot out of 8 time slots=> conducted power divided by (8/1) => -9.00dB

2TX-slots = 2 transmit time slots out of 8 time slots=> conducted power divided by (8/2) => -6.00dB

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

4TX-slots = 4 transmit time slots out of 8 time slots=> conducted power divided by (8/4) => -3.00dB

2. According to the conducted power as above, the GPRS measurements are performed with 4Txslot for GPRS850 and 4Txslot GPRS1900.

The conducted power measurement results for BluetoothV3.0

Mode	Channel	Frequency (MHz)	Conducted Output Average Power (dBm)
GFSK	00	2402	-1.493
	39	2441	0.896
	78	2480	**1.82**
8DPSK	00	2402	-1.092
	39	2441	-0.204
	78	2480	0.65
π/4-DQPSK	00	2402	0.508
	39	2441	-0.317
	78	2480	0.129

Per KDB 447498 D01, the 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:
[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] ·[$\sqrt{f(GHz)}$] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR

- f(GHz) is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison

Next – to – Mouth Exposure Conditions

Bluetooth Turn up Power (dBm)	Separation Distance (mm)	Frequency (GHz)	Exclusion Thresholds	Exclusion Thresholds Limit	Exclusion SAR Test
2.0	10	2.45	0.2	3.0	yes

Extremity Exposure Conditions

Bluetooth Turn up Power (dBm)	Separation Distance (mm)	Frequency (GHz)	Exclusion Thresholds	Exclusion Thresholds Limit	Exclusion SAR Test
2.0	5	2.45	0.5	7.5	yes

Per KDB 447498 D01v05r02, when the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion. Manufacturing tolerance

4.2. Manufacturing tolerance

GSM Speech

GSM 850 (GMSK) (Burst Average Power)			
Channel	Channel 128	Channel 190	Channel 251
Target (dBm)	33.0	33.0	33.0
Tolerance ±(dB)	1.0	1.0	1.0
GSM 1900 (GMSK) (Burst Average Power)			
Channel	Channel 512	Channel 661	Channel 810
Target (dBm)	29.0	29.0	29.0
Tolerance ±(dB)	1.0	1.0	1.0

GSM 850 GPRS (GMSK) (Burst Average Power)				
Channel		128	190	251
1 Txslot	Target (dBm)	31.0	31.0	31.0
	Tolerance ±(dB)	1.0	1.0	1.0
2 Txslot	Target (dBm)	30.5	30.5	30.5
	Tolerance ±(dB)	1.0	1.0	1.0
3 Txslot	Target (dBm)	30.5	30.5	30.5
	Tolerance ±(dB)	1.0	1.0	1.0
4 Txslot	Target (dBm)	31.0	31.0	31.0
	Tolerance ±(dB)	1.0	1.0	1.0
GSM 850 EDGE (8PSK) (Burst Average Power)				
Channel		128	190	251
1 Txslot	Target (dBm)	31.0	31.0	31.0
	Tolerance ±(dB)	1.0	1.0	1.0
2 Txslot	Target (dBm)	30.0	30.0	30.0
	Tolerance ±(dB)	1.0	1.0	1.0
3 Txslot	Target (dBm)	30.0	30.0	30.0
	Tolerance ±(dB)	1.0	1.0	1.0
4 Txslot	Target (dBm)	30.0	30.0	30.0
	Tolerance ±(dB)	1.0	1.0	1.0
GSM 1900 GPRS (GMSK) (Burst Average Power)				
Channel		512	661	810
1 Txslot	Target (dBm)	28.5	28.5	28.5
	Tolerance ±(dB)	1.0	1.0	1.0
2 Txslot	Target (dBm)	28.0	28.0	28.0
	Tolerance ±(dB)	1.0	1.0	1.0
3 Txslot	Target (dBm)	28.0	28.0	28.0
	Tolerance ±(dB)	1.0	1.0	1.0
4 Txslot	Target (dBm)	28.0	28.0	28.0
	Tolerance ±(dB)	1.0	1.0	1.0
GSM 1900 EDGE (8PSK) (Burst Average Power)				
Channel		512	661	810
1 Txslot	Target (dBm)	28.0	28.0	28.0
	Tolerance ±(dB)	1.0	1.0	1.0
2 Txslot	Target (dBm)	27.5	27.5	27.5
	Tolerance ±(dB)	1.0	1.0	1.0
3 Txslot	Target (dBm)	28.0	28.0	28.0
	Tolerance ±(dB)	1.0	1.0	1.0
4 Txslot	Target (dBm)	27.5	27.5	27.5
	Tolerance ±(dB)	1.0	1.0	1.0

Bluetooth V3.0

GFSK (Average)			
Channel	Channel 0	Channel 39	Channel 78
Target (dBm)	-2.0	0.0	1.0
Tolerance ±(dB)	1.0	1.0	1.0
8DPSK (Average)			
Channel	Channel 0	Channel 39	Channel 78
Target (dBm)	-2.0	-1.0	0.0
Tolerance ±(dB)	1.0	1.0	1.0
π/4DQPSK (Average)			
Channel	Channel 0	Channel 39	Channel 78
Target (dBm)	0.0	0.0	-1.0
Tolerance ±(dB)	1.0	1.0	1.0

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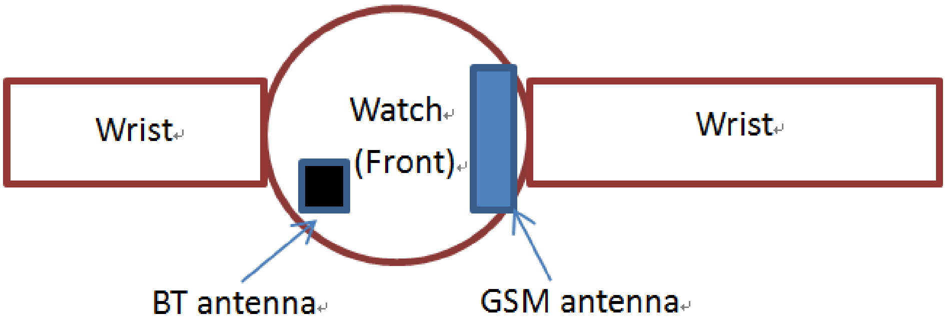
4.3. Transmit Antenna



4.4. SAR Measurement Results

The calculated SAR is obtained by the following formula:

Reported SAR=Measured SAR*10$^{(Ptarget-Pmeasured))/10}$

Scaling factor=10$^{(Ptarget-Pmeasured))/10}$

Reported SAR= Measured SAR* Scaling factor

Where

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

$P_{measured}$ is the measured power;

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

Reported SAR which including Power Drift and Scaling factor

Duty Cycle

Test Mode	Duty Cycle
Speech for GSM850/1900	1:8
GPRS850	1:4
GPRS1900	1:2.67

4.4.1 SAR Results

Next – to – Mouth <Flat / Front (10mm)>

Ch.	Freq. (MHz)	Time slots	Test Position	Conducted Power (dBm)	Maximum Allowed Power (dBm)	Power Drift (%)	Scaling Factor	SAR_{1-g} results(W/kg)		Graph Results
								Measured	Reported	
190	836.6	Voice	Front	33.67	34.00	-0.76	1.079	0.201	**0.217**	Plot 1
661	1880.0	Voice	Front	29.96	30.00	0.69	1.009	0.055	**0.056**	Plot 2

Extremity <Flat / Rear (0mm)>

Ch.	Freq. (MHz)	time slots	Test Position	Conducted Power (dBm)	Maximum Allowed Power (dBm)	Power Drift (%)	Scaling Factor	SAR_{10-g} results(W/kg)		Graph Results
								Measured	Reported	
190	836.6	Voice	Back	33.67	34.00	-2.66	1.079	0.926	0.999	
190	836.6	4Txslots	Back	31.54	32.00	-0.25	1.112	1.743	**1.938**	Plot 3
661	1880.0	Voice	Back	29.96	30.00	0.48	1.009	0.328	0.331	
661	1880.0	4Txslots	Back	28.72	29.00	2.55	1.067	0.420	**0.448**	Plot 4

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

4.4.2 Standalone SAR Test Exclusion Considerations and Estimated SAR

Per KDB447498 requires when the standalone SAR test exclusion of section 4.3.1 is applied to an antenna that transmits simultaneously with other antennas, the standalone SAR must be estimated according to the following to determine simultaneous transmission SAR test exclusion;
● (max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] • [√ f(GHz)/x] W/kg for test separation distances ≤ 50 mm;
where x = 7.5 for 1-g SAR, and x = 18.75 for 10-g SAR.
● 0.4 W/kg for 1-g SAR and 1.0 W/kg for 10-g SAR, when the test separation distances is > 50 mm
Per FCC KD B447498 D01,simultaneous transmission SAR test exclusion may be applied when the sum of the 1-g SAR for all the transmitting antenna in a specific a physical test configuration is ≤1.6 W/Kg.When the sum is greater than the SAR limit,SAR test exclusion is determined by the SAR to peak location separation ratio.

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

Next – to – Mouth Exposure Conditions

Estimated stand alone SAR					
Communication system	Frequency (MHz)	Configuration	Maximum Power (including tune-up tolerance) (dBm)	Separation Distance (mm)	Estimated SAR_{1-g} (W/kg)
Bluetooth*	2450	Body	2.0	10	0.033

Bluetooth*- Including Lower Energy Bluetooth

Extremity Exposure Conditions

Estimated stand alone SAR					
Communication system	Frequency (MHz)	Configuration	Maximum Power (including tune-up tolerance) (dBm)	Separation Distance (mm)	Estimated SAR_{10-g} (W/kg)
Bluetooth*	2450	Body	2.0	5	0.066

Bluetooth*- Including Lower Energy Bluetooth

Per KDB 447498 D01v05r02, when the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion. Manufacturing tolerance

4.5. Simultaneous TX SAR Considerations

4.5.1 Introduction

The following procedures adopted from “FCC SAR Considerations for Cell Phones with Multiple Transmitters” are applicable to handsets with built-in unlicensed transmitters such as Bluetooth devices which may simultaneously transmit with the licensed transmitter.
For the DUT,GSM and BT share difference modular and diffence antenna, need consider simultaneous transmitter.
Application Simultaneous Transmission information:

Air-Interface	Band (MHz)	Type	Simultaneous Transmissions	Voice over Digital Transport(Data)
GSM	850	VO	Yes, BT	N/A
	1900	VO		
	GPRS	DT	Yes, BT	N/A
BT	2450	DT	Yes, GSM, GPRS	N/A
Note:VO-Voice Service only;DT-Digital Transport				

Note: Bluetooth low energy;
BT- Classical Bluetooth

4.5.2 Evaluation of Simultaneous SAR

Next – to – Mouth Exposure Conditions

Simultaneous transmission SAR for BT and GSM

Test Position	GSM850 Reported SAR_{1-g} (W/Kg)	GSM1900 Reported SAR_{1-g} (W/Kg)	BT Estimated SAR_{1-g} (W/Kg)	MAX. ΣSAR_{1-g} (W/Kg)	SAR_{1-g} Limit (W/Kg)	Peak location separation ratio	Simut Meas. Required
Front	0.217	0.056	0.033	0.250	1.6	no	no

Extremity Exposure Conditions

Test Position	GSM850 Reported SAR_{10-g} (W/Kg)	GSM1900 Reported SAR_{10-g} (W/Kg)	BT Estimated SAR_{10-g} (W/Kg)	MAX. ΣSAR_{10-g} (W/Kg)	SAR_{10-g} Limit (W/Kg)	Peak location separation ratio	Simut Meas. Required
Rear	1.938	0.448	0.066	2.004	4.0	no	no

4.6. SAR Measurement Variability

According to KDB865664, Repeated measurements are required only when the measured SAR is ≥ 0.80 W/kg. If the measured SAR value of the initial repeated measurement is < 1.45 W/kg with ≤ 20% variation, only one repeated measurement is required to reaffirm that the results are not expected to have substantial variations, which may introduce significant compliance concerns. A second repeated measurement is required only if the measured result for the initial repeated measurement is within 10% of the SAR limit and vary by more than 20%, which are often related to device and measurement setup difficulties. The following procedures are applied to determine if repeated measurements are required. 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.19 The repeated measurement results must be clearly identified in the SAR report. All measured SAR, including the repeated results, must be considered to determine compliance and for reporting according to KDB 690783.Repeated measurement is not required when the original highest measured SAR is < 0.80 W/kg; steps 2) through 4) do not apply.

1) When the original highest measured SAR is ≥ 0.80 W/kg, repeat that measurement once.
2) 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).
3) 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.
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

Next – to – Mouth Exposure Conditions

Frequency Band (MHz)	Air Interface	RF Exposure Configuration	Test Position	Repeated SAR (yes/no)	Highest Measured SAR_{1-g} (W/Kg)	First Repeated	
						Measued SAR_{1-g} (W/Kg)	Largest to Smallest SAR Ratio
850	GSM850	Standalone	Front	no	0.201	n/a	n/a
1900	GSM1900	Standalone	Front	no	0.055	n/a	n/a

Extremity Exposure Conditions

Frequency Band (MHz)	Air Interface	RF Exposure Configuration	Test Position	Repeated SAR (yes/no)	Highest Measured SAR_{10-g} (W/Kg)	First Repeated	
						Measued SAR_{10-g} (W/Kg)	Largest to Smallest SAR Ratio
850	GSM850	Standalone	Rear	no	1.743	n/a	n/a
1900	GSM1900	Standalone	Rear	no	0.420	n/a	n/a

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4.7. General description of test procedures

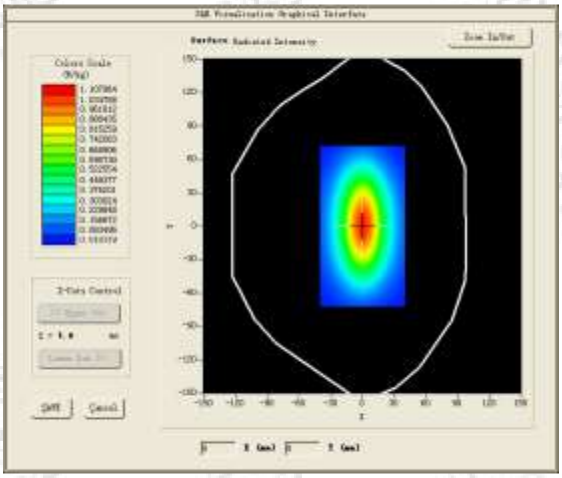
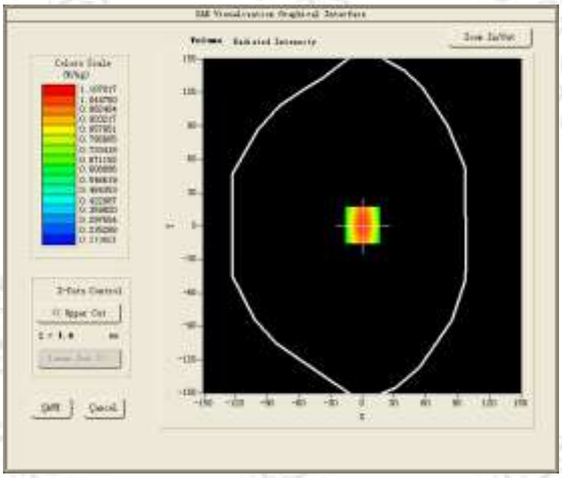
1. The DUT is tested using CMU 200 communications testers as controller unit to set test channels and maximum output power to the DUT, as well as for measuring the conducted peak power.
2. Test positions as described in the tables above are in accordance with the specified test standard.
3. Tests in body position were performed in that configuration, which generates the highest time based averaged output power (see conducted power results).
4. Tests in head position with GSM were performed in voice mode with 1 timeslot unless GPRS/EGPRS/DTM function allows parallel voice and data traffic on 2 or more timeslots.
5. According to KDB 447498 D01 testing of other required channels within the operating mode of a frequency band is not required when the reported 1-g or 10-g SAR for the mid-band or highest output power channel is:
   ● ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
   ● ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz
   ● ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz
6. Per KDB648474 D04 require when the reported SAR for a body-worn accessory, measured without a headset connected to the handset, is < 1.2 W/kg.

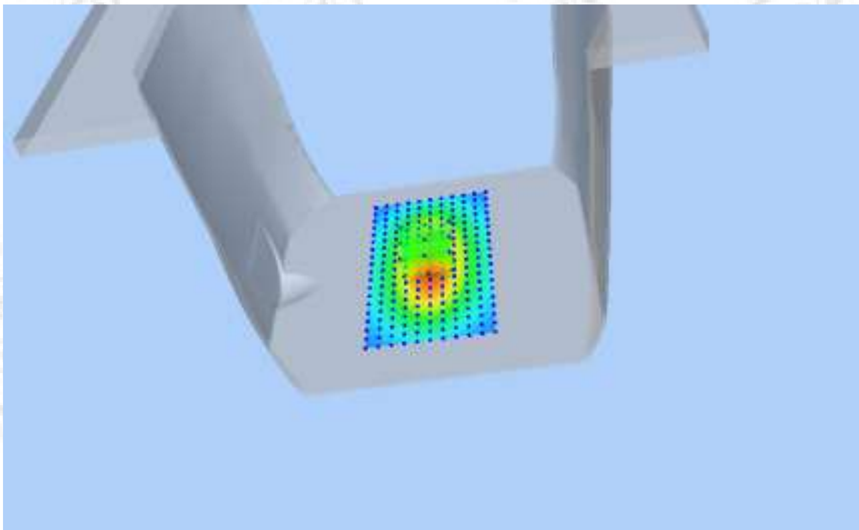
4.8. Measurement Uncertainty (300MHz-6GHz)

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

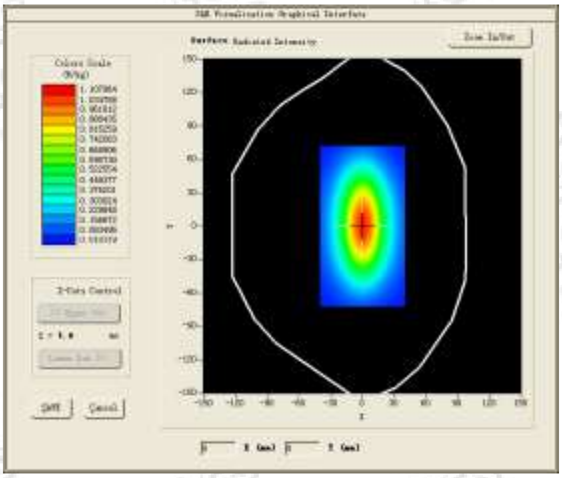
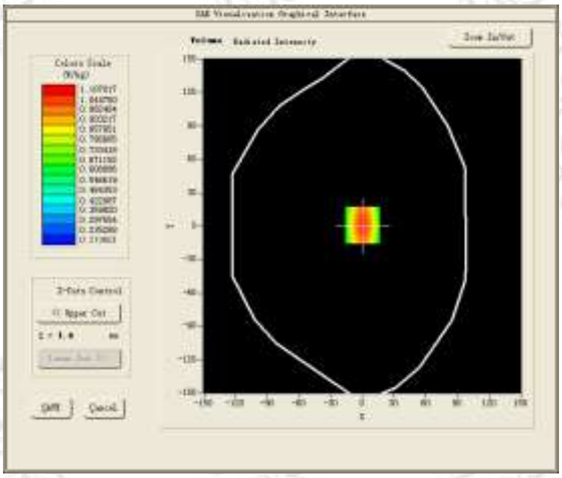
4.9. System Check Results

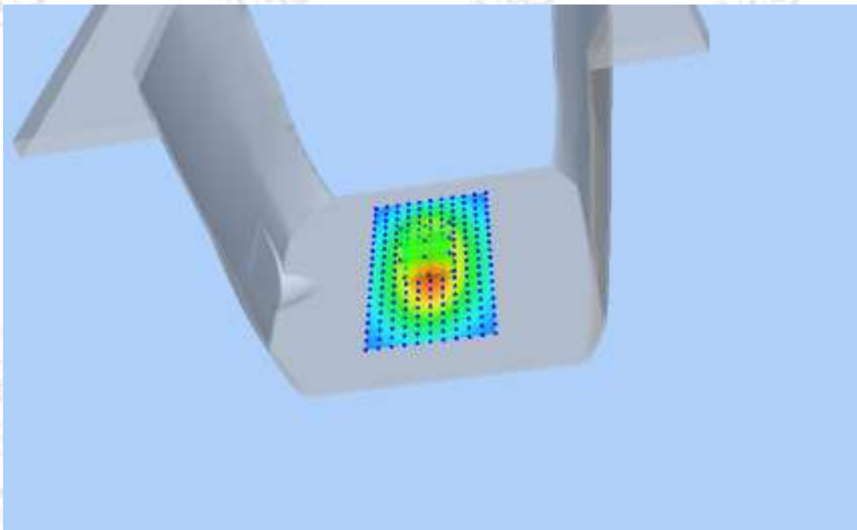
Test mode:835MHz(Head)
Product Description:Validation
Model:Dipole SID835
E-Field Probe:SSE5(SN17/14 EP220)
Test Date: September 08, 2016

Medium(liquid type)	HSL_850
Frequency (MHz)	835.000000
Relative permittivity (real part)	43.22
Conductivity (S/m)	0.93
Input power	100mW
Crest Factor	1.0
Conversion Factor	4.86
Variation (%)	-1.5700000
SAR 10g (W/Kg)	0.6047063
SAR 1g (W/Kg)	0.9471289
SURFACE SAR	**VOLUME SAR**
	

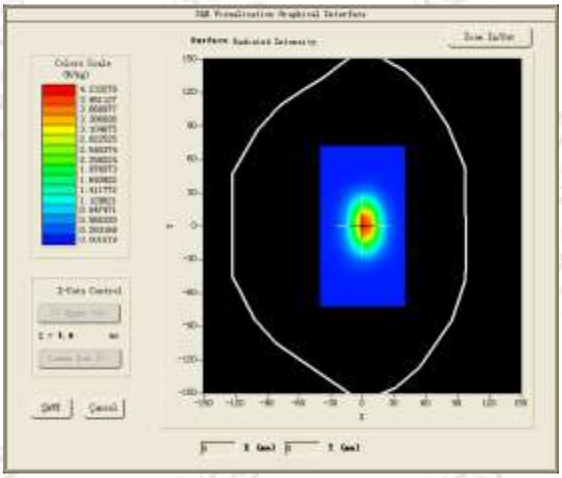
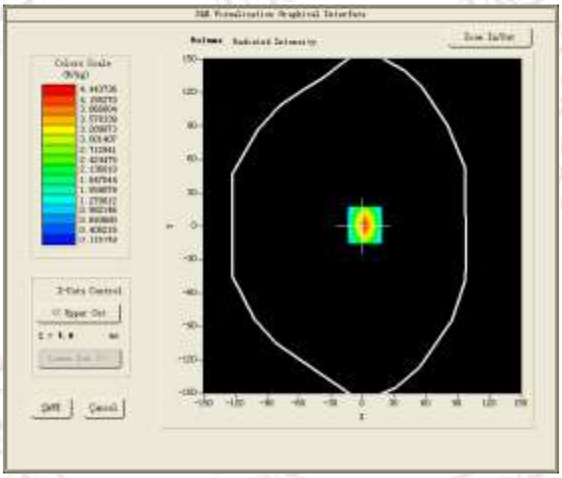


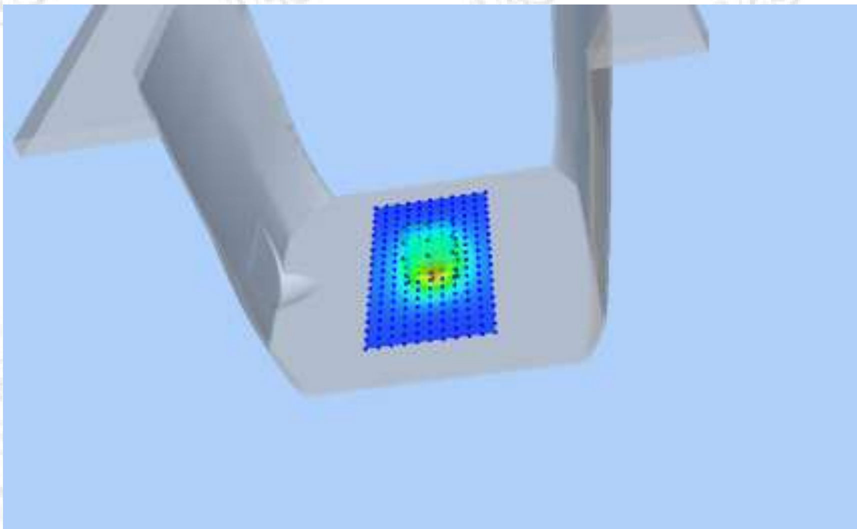
Test mode:835MHz(Body)
Product Description:Validation
Model:Dipole SID835
E-Field Probe:SSE5(SN17/14 EP220)
Test Date: September 08, 2016

Medium(liquid type)	MSL_850
Frequency (MHz)	835.0000
Relative permittivity (real part)	57.18
Conductivity (S/m)	0.98
Input power	100mW
Crest Factor	1.0
Conversion Factor	5.04
Variation (%)	0.9100000
SAR 10g (W/Kg)	0.6130225
SAR 1g (W/Kg)	0.9800314
SURFACE SAR	**VOLUME SAR**
	

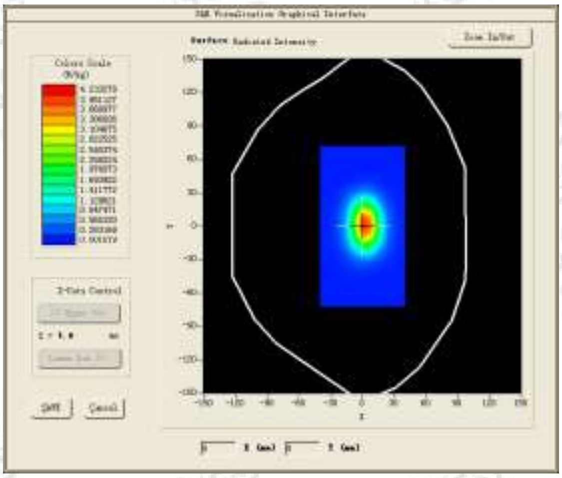
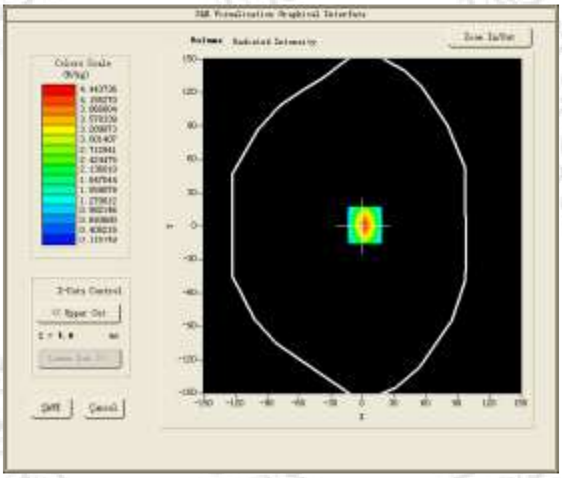


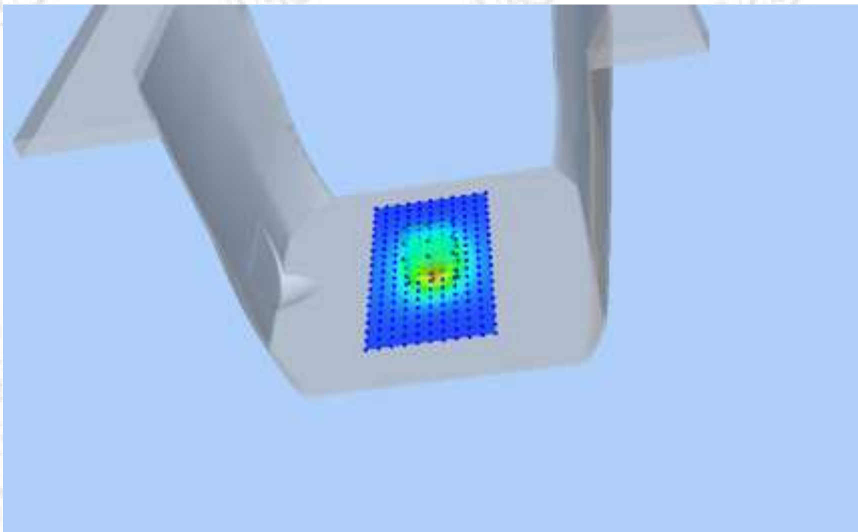
Test mode:1900MHz(Head)
Product Description:Validation
Model :Dipole SID1900
E-Field Probe:SSE5(SN17/14 EP221)
Test Date: September 09, 2016

Medium(liquid type)	HSL_1900
Frequency (MHz)	1900.0000
Relative permittivity (real part)	41.50
Conductivity (S/m)	1.45
Input power	100mW
Crest Factor	1.0
Conversion Factor	4.71
Variation (%)	-0.4300000
SAR 10g (W/Kg)	1.8742638
SAR 1g (W/Kg)	3.7003144
SURFACE SAR	**VOLUME SAR**
	



Test mode:1900MHz(Body)
Product Description:Validation
Model :Dipole SID1900
E-Field Probe:SSE5(SN17/14 EP221)
Test Date: September 09, 2016

Medium(liquid type)	MSL_1900
Frequency (MHz)	1900.0000
Relative permittivity (real part)	54.83
Conductivity (S/m)	1.56
Input power	100mW
Crest Factor	1.0
Conversion Factor	4.85
Variation (%)	1.5300000
SAR 10g (W/Kg)	1.9452841
SAR 1g (W/Kg)	3.9754816
SURFACE SAR	**VOLUME SAR**
	

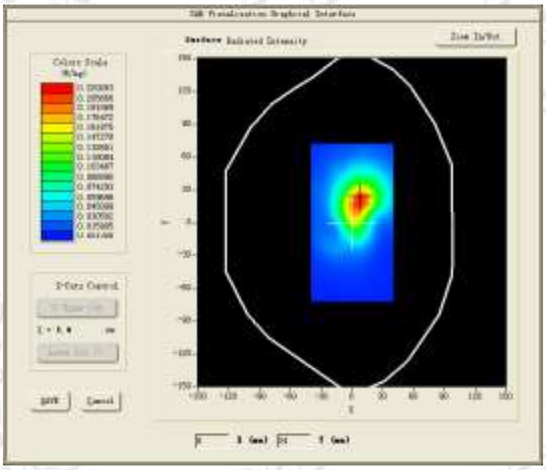
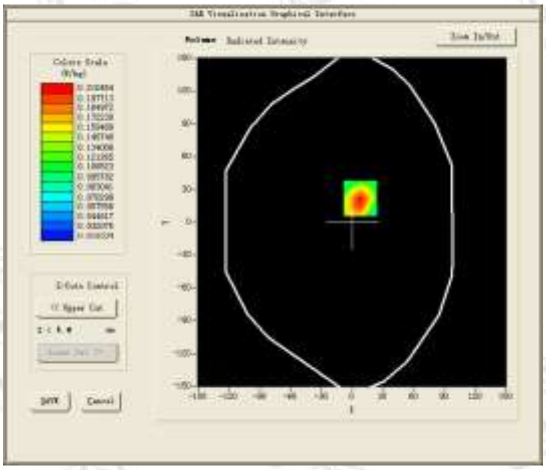


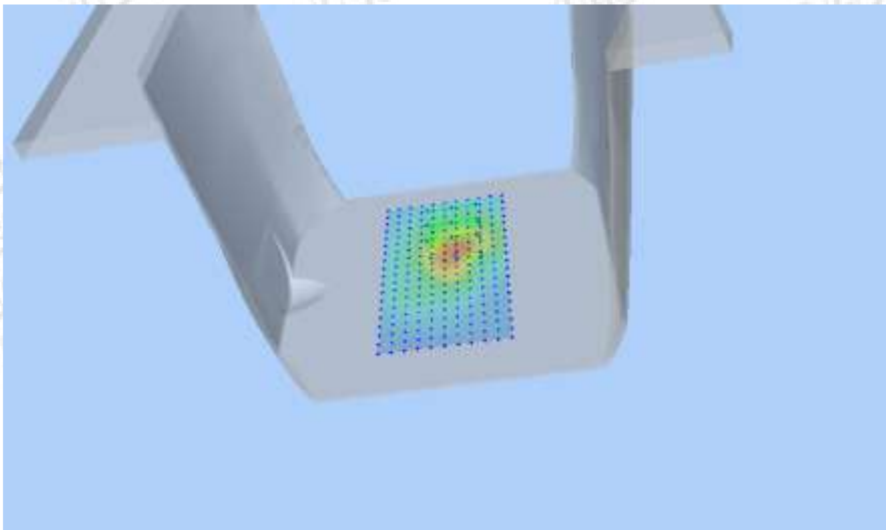
4.10. SAR Test Graph Results

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

#1

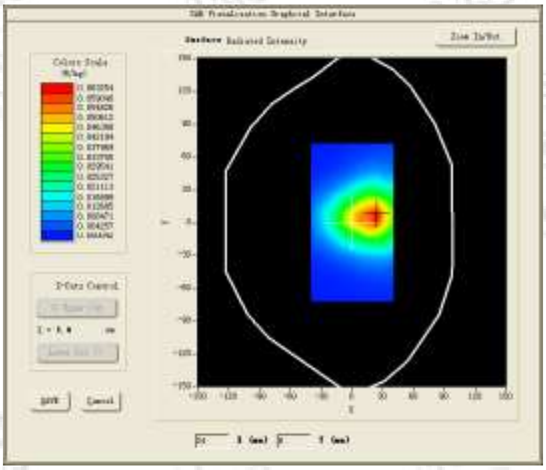
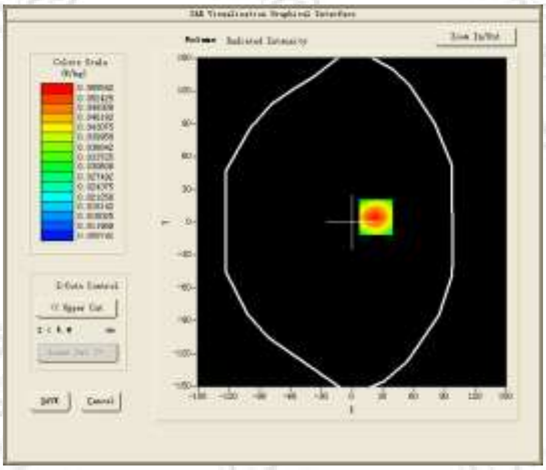
Test Mode:GSM 850MHz,Mid channel <Next – to – Mouth (Flat / Front 10mm)>
Product Description: Smart Watch
Model: S1
Test Date: September 08, 2016

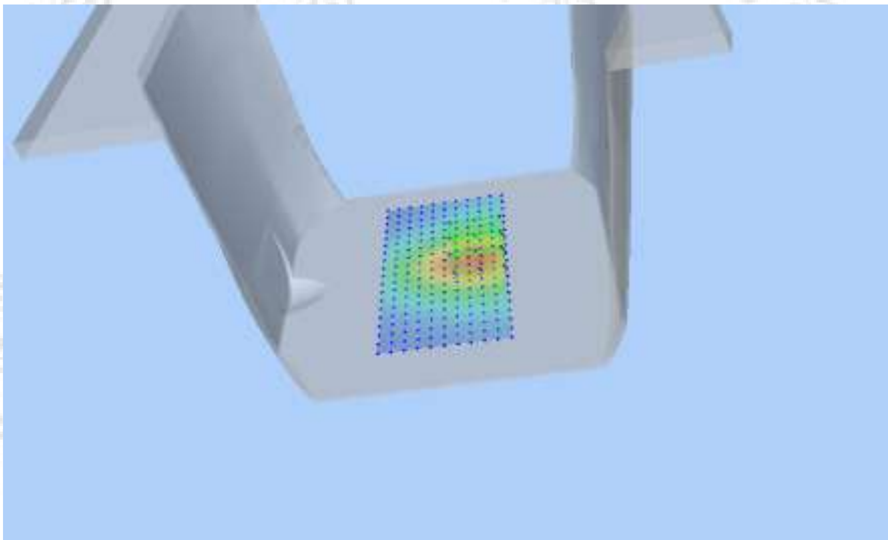
Medium(liquid type)	MSL_850
Frequency (MHz)	836.600000
Relative permittivity (real part)	43.22
Conductivity (S/m)	0.93
E-Field Probe	SN 17/14 EP220
Crest Factor	8.0
Conversion Factor	4.86
Sensor	4mm
Area Scan	dx=8mm dy=8mm
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Variation (%)	-0.760000
SAR 10g (W/Kg)	0.119379
SAR 1g (W/Kg)	0.201099
SURFACE SAR	**VOLUME SAR**
	



#2

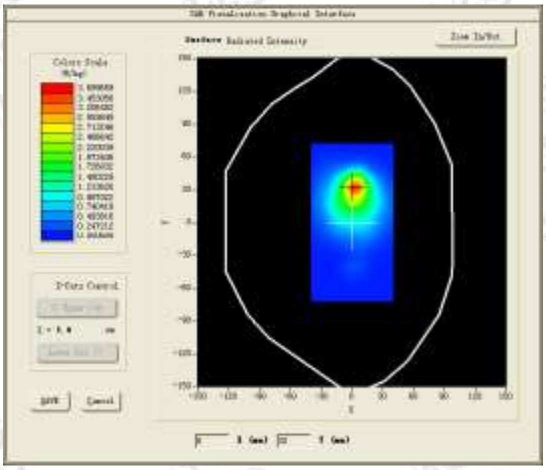
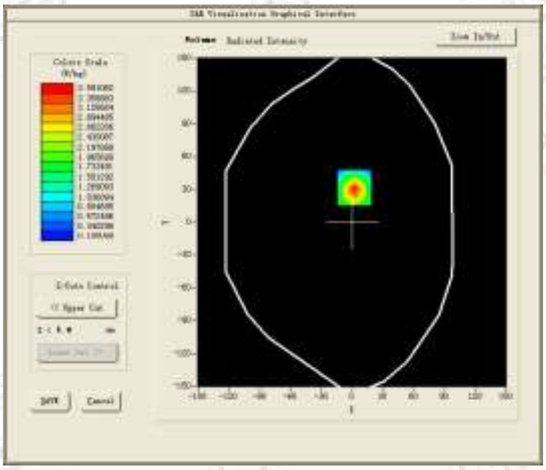
Test Mode:GSM 1900MHz,Mid channel <Next – to – Mouth (Flat / Front 10mm)>
Product Description: Smart Watch
Model: S1
Test Date: September 09, 2016

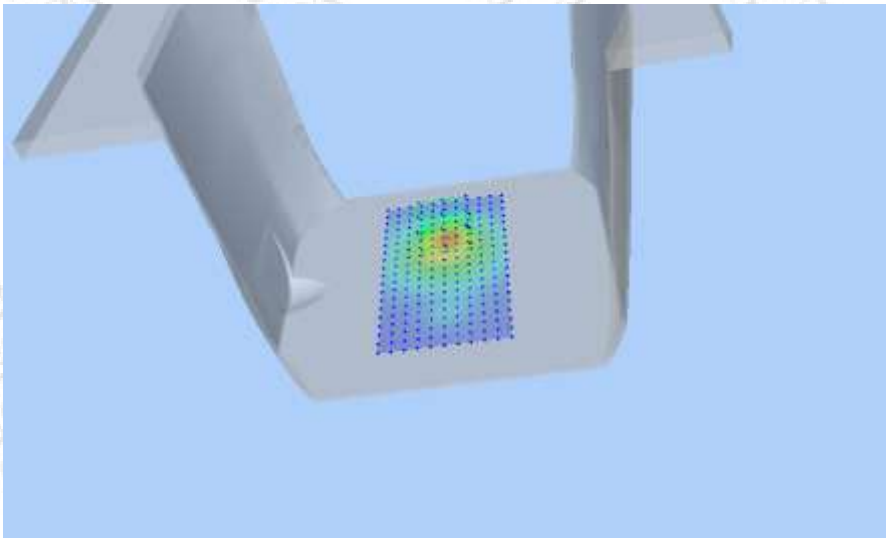
Medium(liquid type)	MSL_1900
Frequency (MHz)	1880.000000
Relative permittivity (real part)	41.71
Conductivity (S/m)	1.45
E-Field Probe	SN17/14 EP221
Crest Factor	1.0
Conversion Factor	4.71
Sensor	4mm
Area Scan	dx=8mm dy=8mm
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Variation (%)	0.690000
SAR 10g (W/Kg)	0.033777
SAR 1g (W/Kg)	0.054619
SURFACE SAR	**VOLUME SAR**
	



#3

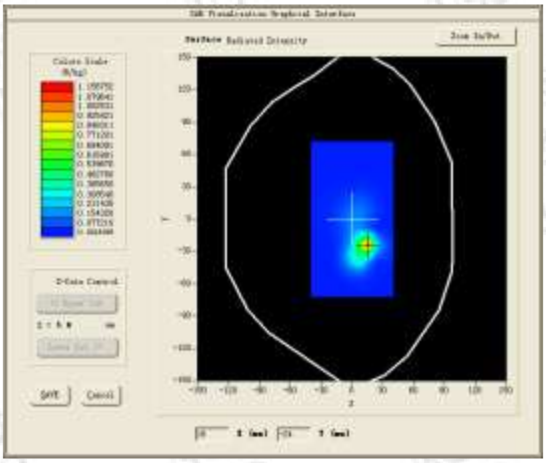
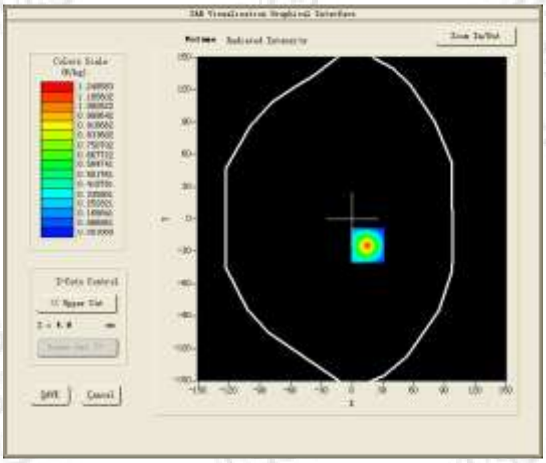
Test Mode:GPRS 850MHz,Mid channel <Extremity Exposure (Flat / Rear 0mm)>
Product Description: Smart Watch
Model: S1
Test Date: September 08, 2016

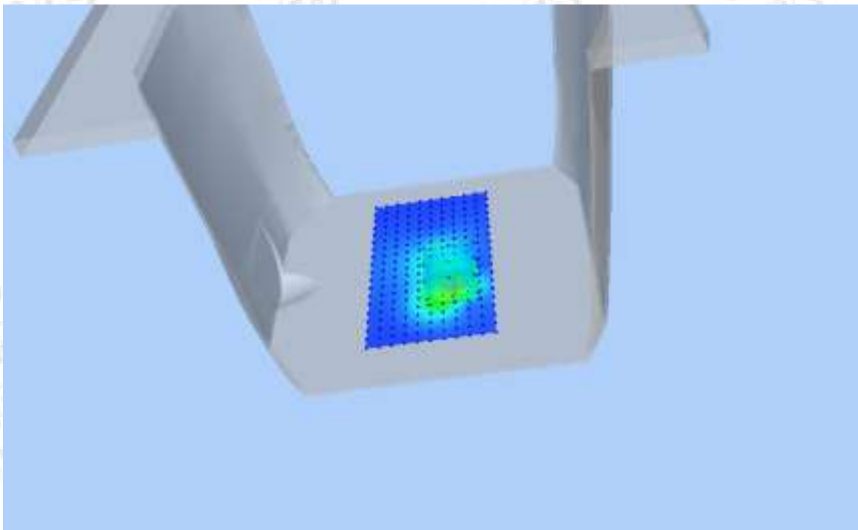
Medium(liquid type)	MSL_850
Frequency (MHz)	836.600000
Relative permittivity (real part)	57.63
Conductivity (S/m)	0.96
E-Field Probe	SN 17/14 EP220
Crest Factor	8.0
Conversion Factor	5.04
Sensor	4mm
Area Scan	dx=8mm dy=8mm
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Variation (%)	-0.250000
SAR 10g (W/Kg)	1.742601
SAR 1g (W/Kg)	3.369502
SURFACE SAR	**VOLUME SAR**
	



#4

Test Mode:GPRS 1900MHz,Mid channel <Extremity Exposure (Flat / Rear 0mm)>
Product Description: Smart Watch
Model: S1
Test Date: September 09, 2016

Medium(liquid type)	MSL_1900
Frequency (MHz)	1880.000000
Relative permittivity (real part)	55.13
Conductivity (S/m)	1.55
E-Field Probe	SN 17/14 EP221
Crest Factor	1.0
Conversion Factor	4.85
Sensor	4mm
Area Scan	dx=8mm dy=8mm
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Variation (%)	2.550000
SAR 10g (W/Kg)	0.420392
SAR 1g (W/Kg)	1.106932
SURFACE SAR	**VOLUME SAR**
	



5.CALIBRATION CERTIFICATES

5.1 Probe-EP220 Calibration Certificate

SATIMO
The microwave vision company

COMOSAR E-Field Probe Calibration Report

Ref : ACR.287.1.14.SATU.A

SHENZHEN LCS COMPLIANCE TESTING LABORATORY LTD.
1F., XINGYUAN INDUSTRIAL PARK, TONGDA ROAD, BAO'AN BLVD
BAO'AN DISTRICT, SHENZHEN, GUANGDONG, CHINA
SATIMO COMOSAR DOSIMETRIC E-FIELD PROBE
SERIAL NO.: SN 17/14 EP220

Calibrated at SATIMO US
2105 Barrett Park Dr. - Kennesaw, GA 30144

ilac-MRA ACCREDITED

10/01/2015

Summary:

This document presents the method and results from an accredited COMOSAR Dosimetric E-Field Probe calibration performed in SATIMO USA using the CALISAR / CALIBAIR test bench, for use with a SATIMO COMOSAR system only. All calibration results are traceable to national metrology institutions.

SATIMO

COMOSAR E-FIELD PROBE CALIBRATION REPORT

Ref: ACR.287.1.14.SATU.A

	Name	Function	Date	Signature
Prepared by :	Jérôme LUC	Product Manager	10/14/2015	JS
Checked by :	Jérôme LUC	Product Manager	10/14/2015	JS
Approved by :	Kim RUTKOWSKI	Quality Manager	10/14/2015	Kim Rutkowski

	Customer Name
Distribution :	Shenzhen LCS Compliance Testing Laboratory Ltd.

Issue	Date	Modifications
A	10/14/2015	Initial release

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1 DEVICE UNDER TEST

Device Under Test	
Device Type	COMOSAR DOSIMETRIC E FIELD PROBE
Manufacturer	Satimo
Model	SSE5
Serial Number	SN 17/14 EP220
Product Condition (new / used)	New
Frequency Range of Probe	0.7 GHz-3GHz
Resistance of Three Dipoles at Connector	Dipole 1: R1=0.179 MΩ Dipole 2: R2=0.175 MΩ Dipole 3: R3=0.180 MΩ

A yearly calibration interval is recommended.

2 PRODUCT DESCRIPTION

2.1 GENERAL INFORMATION

Satimo's COMOSAR E field Probes are built in accordance to the IEEE 1528, OET 65 Bulletin C and CEI/IEC 62209 standards.

Figure 1 – *Satimo COMOSAR Dosimetric E field Dipole*

Probe Length	330 mm
Length of Individual Dipoles	4.5 mm
Maximum external diameter	8 mm
Probe Tip External Diameter	5 mm
Distance between dipoles / probe extremity	2.7 mm

3 MEASUREMENT METHOD

The IEEE 1528, OET 65 Bulletin C, CENELEC EN50361 and CEI/IEC 62209 standards provide recommended practices for the probe calibrations, including the performance characteristics of interest and methods by which to assess their affect. All calibrations / measurements performed meet the fore mentioned standards.

3.1 LINEARITY

The evaluation of the linearity was done in free space using the waveguide, performing a power sweep to cover the SAR range 0.01W/kg to 100W/kg.

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3.2 SENSITIVITY

The sensitivity factors of the three dipoles were determined using a two step calibration method (air and tissue simulating liquid) using waveguides as outlined in the standards.

3.3 LOWER DETECTION LIMIT

The lower detection limit was assessed using the same measurement set up as used for the linearity measurement. The required lower detection limit is 10 mW/kg.

3.4 ISOTROPY

The axial isotropy was evaluated by exposing the probe to a reference wave from a standard dipole with the dipole mounted under the flat phantom in the test configuration suggested for system validations and checks. The probe was rotated along its main axis from 0 - 360 degrees in 15 degree steps. The hemispherical isotropy is determined by inserting the probe in a thin plastic box filled with tissue-equivalent liquid, with the plastic box illuminated with the fields from a half wave dipole. The dipole is rotated about its axis (0°–180°) in 15° increments. At each step the probe is rotated about its axis (0°–360°).

3.5 BOUNDARY EFFECT

The boundary effect is defined as the deviation between the SAR measured data and the expected exponential decay in the liquid when the probe is oriented normal to the interface. To evaluate this effect, the liquid filled flat phantom is exposed to fields from either a reference dipole or waveguide. With the probe normal to the phantom surface, the peak spatial average SAR is measured and compared to the analytical value at the surface.

4 MEASUREMENT UNCERTAINTY

The guidelines outlined in the IEEE 1528, OET 65 Bulletin C, CENELEC EN50361 and CEI/IEC 62209 standards were followed to generate the measurement uncertainty associated with an E-field probe calibration using the waveguide technique. All uncertainties listed below represent an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2, traceable to the Internationally Accepted Guides to Measurement Uncertainty.

Uncertainty analysis of the probe calibration in waveguide					
ERROR SOURCES	**Uncertainty value (%)**	**Probability Distribution**	**Divisor**	**ci**	**Standard Uncertainty (%)**
Incident or forward power	3.00%	Rectangular	$\sqrt{3}$	1	1.732%
Reflected power	3.00%	Rectangular	$\sqrt{3}$	1	1.732%
Liquid conductivity	5.00%	Rectangular	$\sqrt{3}$	1	2.887%
Liquid permittivity	4.00%	Rectangular	$\sqrt{3}$	1	2.309%
Field homogeneity	3.00%	Rectangular	$\sqrt{3}$	1	1.732%
Field probe positioning	5.00%	Rectangular	$\sqrt{3}$	1	2.887%
Field probe linearity	3.00%	Rectangular	$\sqrt{3}$	1	1.732%

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Combined standard uncertainty					5.831%
Expanded uncertainty 95 % confidence level k = 2					12.0%

5 CALIBRATION MEASUREMENT RESULTS

Calibration Parameters	
Liquid Temperature	21 °C
Lab Temperature	21 °C
Lab Humidity	45 %

5.1 SENSITIVITY IN AIR

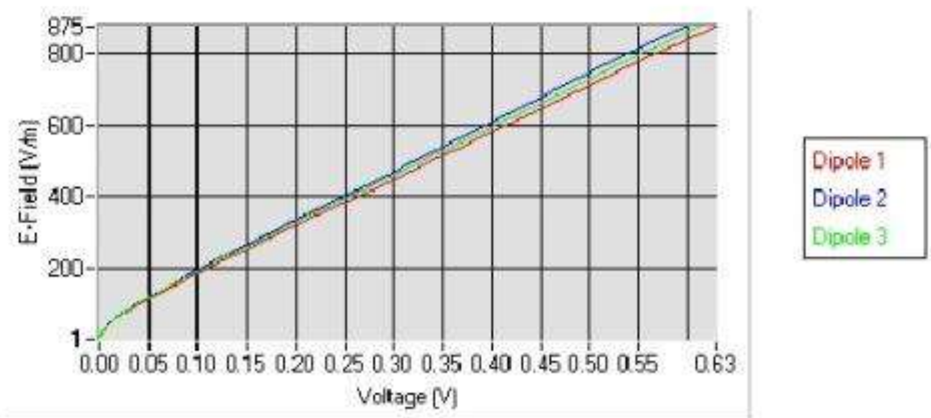
Normx dipole 1 ($\mu V/(V/m)^2$)	Normy dipole 2 ($\mu V/(V/m)^2$)	Normz dipole 3 ($\mu V/(V/m)^2$)
6.02	5.52	5.72

DCP dipole 1 (mV)	DCP dipole 2 (mV)	DCP dipole 3 (mV)
99	98	99

Calibration curves ei=f(V) (i=1,2,3) allow to obtain H-field value using the formula:

$$E = \sqrt{E_1^{\ 2} + E_2^{\ 2} + E_3^{\ 2}}$$

Calibration curves



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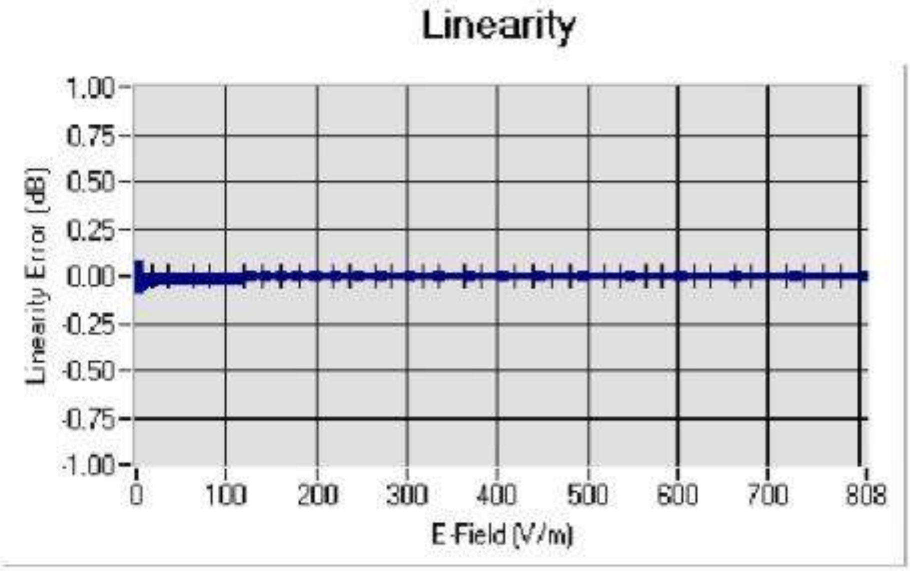
5.2 LINEARITY



Linearity:+/-1.47% (+/-0.06dB)

5.3 SENSITIVITY IN LIQUID

Liquid	Frequency (MHz +/- 100MHz)	Permittivity	Epsilon (S/m)	ConvF
HL750	750	42.06	0.89	4.58
BL750	750	56.57	0.99	4.71
HL850	835	42.81	0.89	4.86
BL850	835	53.46	0.96	5.04
HL900	900	42.47	0.96	4.74
BL900	900	56.69	1.08	4.92
HL1800	1800	41.31	1.38	4.16
BL1800	1800	53.27	1.51	4.29
HL2000	2000	39.72	1.43	4.19
BL2000	2000	53.91	1.53	4.28
HL2450	2450	39.05	1.77	3.94
BL2450	2450	52.97	1.93	4.05

LOWER DETECTION LIMIT: 7mW/kg

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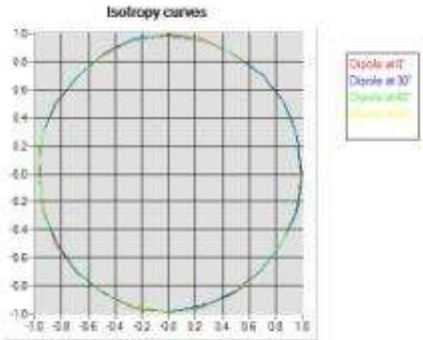
5.4 ISOTROPY

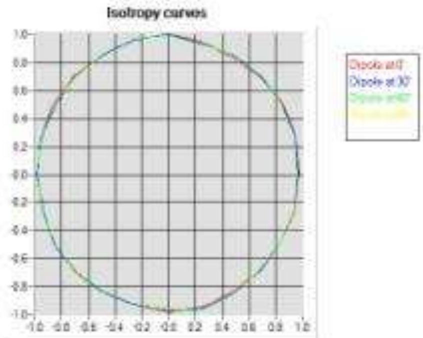
HL900 MHz

- Axial isotropy: 0.04 dB
- Hemispherical isotropy: 0.07 dB



HL1800 MHz

- Axial isotropy: 0.06 dB
- Hemispherical isotropy: 0.08 dB



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6 LIST OF EQUIPMENT

Equipment Summary Sheet				
Equipment Description	**Manufacturer / Model**	**Identification No.**	**Current Calibration Date**	**Next Calibration Date**
Flat Phantom	Satimo	SN-20/09-SAM71	Validated. No cal required.	Validated. No cal required.
COMOSAR Test Bench	Version 3	NA	Validated. No cal required.	Validated. No cal required.
Network Analyzer	Rhode & Schwarz ZVA	SN100132	02/2013	02/2016
Reference Probe	Satimo	EP 94 SN 37/08	10/2015	10/2016
Multimeter	Keithley 2000	1188656	12/2013	12/2016
Signal Generator	Agilent E4438C	MY49070581	12/2013	12/2016
Amplifier	Aethercomm	SN 046	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Power Meter	HP E4418A	US38261498	12/2013	12/2016
Power Sensor	HP ECP-E26A	US37181460	12/2013	12/2016
Directional Coupler	Narda 4216-20	01386	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Waveguide	Mega Industries	069Y7-158-13-712	Validated. No cal required.	Validated. No cal required.
Waveguide Transition	Mega Industries	069Y7-158-13-701	Validated. No cal required.	Validated. No cal required.
Waveguide Termination	Mega Industries	069Y7-158-13-701	Validated. No cal required.	Validated. No cal required.
Temperature / Humidity Sensor	Control Company	11-661-9	8/2013	8/2016

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5.2 Probe-EP221 Calibration Certificate

COMOSAR E-Field Probe Calibration Report

Ref : ACR.262.1.14.SATU.A

SHENZHEN LCS COMPLIANCE TESTING LABORATORY LTD.

1/F, XINGYUAN INDUSTRIAL PARK, TONGDA ROAD, BAO'AN BLVD

BAO'AN DISTRICT, SHENZHEN, GUANGDONG, CHINA

SATIMO COMOSAR DOSIMETRIC E-FIELD PROBE

SERIAL NO.: SN 17/14 EP221

Calibrated at SATIMO US

2105 Barrett Park Dr. - Kennesaw, GA 30144

09/01/2015

Summary:

This document presents the method and results from an accredited COMOSAR Dosimetric E-Field Probe calibration performed in SATIMO USA using the CALISAR / CALIBAIR test bench, for use with a SATIMO COMOSAR system only. All calibration results are traceable to national metrology institutions.

	Name	Function	Date	Signature
Prepared by :	Jérôme LUC	Product Manager	9/19/2015	
Checked by :	Jérôme LUC	Product Manager	9/19/2015	
Approved by :	Kim RUTKOWSKI	Quality Manager	9/19/2015	Kim Rutkowski

	Customer Name
Distribution :	Shenzhen LCS Compliance Testing Laboratory Ltd.

Issue	Date	Modifications
A	9/19/2015	Initial release

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1 DEVICE UNDER TEST

Device Under Test	
Device Type	COMOSAR DOSIMETRIC E FIELD PROBE
Manufacturer	Satimo
Model	SSE5
Serial Number	SN 17/14 EP221
Product Condition (new / used)	New
Frequency Range of Probe	0.4 GHz- 6 GHz
Resistance of Three Dipoles at Connector	Dipole 1: R1=0.179 MΩ Dipole 2: R2=0.167 MΩ Dipole 3: R3=0.178 MΩ

A yearly calibration interval is recommended.

2 PRODUCT DESCRIPTION

2.1 GENERAL INFORMATION

Satimo's COMOSAR E field Probes are built in accordance to the IEEE 1528, OET 65 Bulletin C and CEI/IEC 62209 standards.

Figure 1 – *Satimo COMOSAR Dosimetric E field Dipole*

Probe Length	330 mm
Length of Individual Dipoles	4.5 mm
Maximum external diameter	8 mm
Probe Tip External Diameter	5 mm
Distance between dipoles / probe extremity	2.7 mm

3 MEASUREMENT METHOD

The IEEE 1528, OET 65 Bulletin C, CENELEC EN50361 and CEI/IEC 62209 standards provide recommended practices for the probe calibrations, including the performance characteristics of interest and methods by which to assess their affect. All calibrations / measurements performed meet the fore mentioned standards.

3.1 LINEARITY

The evaluation of the linearity was done in free space using the waveguide, performing a power sweep to cover the SAR range 0.01W/kg to 100W/kg.

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3.2 SENSITIVITY

The sensitivity factors of the three dipoles were determined using a two step calibration method (air and tissue simulating liquid) using waveguides as outlined in the standards.

3.3 LOWER DETECTION LIMIT

The lower detection limit was assessed using the same measurement set up as used for the linearity measurement. The required lower detection limit is 10 mW/kg.

3.4 ISOTROPY

The axial isotropy was evaluated by exposing the probe to a reference wave from a standard dipole with the dipole mounted under the flat phantom in the test configuration suggested for system validations and checks. The probe was rotated along its main axis from 0 - 360 degrees in 15 degree steps. The hemispherical isotropy is determined by inserting the probe in a thin plastic box filled with tissue-equivalent liquid, with the plastic box illuminated with the fields from a half wave dipole. The dipole is rotated about its axis (0°–180°) in 15° increments. At each step the probe is rotated about its axis (0°–360°).

3.5 BOUNDARY EFFECT

The boundary effect is defined as the deviation between the SAR measured data and the expected exponential decay in the liquid when the probe is oriented normal to the interface. To evaluate this effect, the liquid filled flat phantom is exposed to fields from either a reference dipole or waveguide. With the probe normal to the phantom surface, the peak spatial average SAR is measured and compared to the analytical value at the surface.

4 MEASUREMENT UNCERTAINTY

The guidelines outlined in the IEEE 1528, OET 65 Bulletin C, CENELEC EN50361 and CEI/IEC 62209 standards were followed to generate the measurement uncertainty associated with an E-field probe calibration using the waveguide technique. All uncertainties listed below represent an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2, traceable to the Internationally Accepted Guides to Measurement Uncertainty.

Uncertainty analysis of the probe calibration in waveguide					
ERROR SOURCES	**Uncertainty value (%)**	**Probability Distribution**	**Divisor**	**ci**	**Standard Uncertainty (%)**
Incident or forward power	3.00%	Rectangular	$\sqrt{3}$	1	1.732%
Reflected power	3.00%	Rectangular	$\sqrt{3}$	1	1.732%
Liquid conductivity	5.00%	Rectangular	$\sqrt{3}$	1	2.887%
Liquid permittivity	4.00%	Rectangular	$\sqrt{3}$	1	2.309%
Field homogeneity	3.00%	Rectangular	$\sqrt{3}$	1	1.732%
Field probe positioning	5.00%	Rectangular	$\sqrt{3}$	1	2.887%
Field probe linearity	3.00%	Rectangular	$\sqrt{3}$	1	1.732%

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Combined standard uncertainty					5.831%
Expanded uncertainty 95 % confidence level k = 2					12.0%

5 CALIBRATION MEASUREMENT RESULTS

Calibration Parameters	
Liquid Temperature	21 °C
Lab Temperature	21 °C
Lab Humidity	45 %

5.1 SENSITIVITY IN AIR

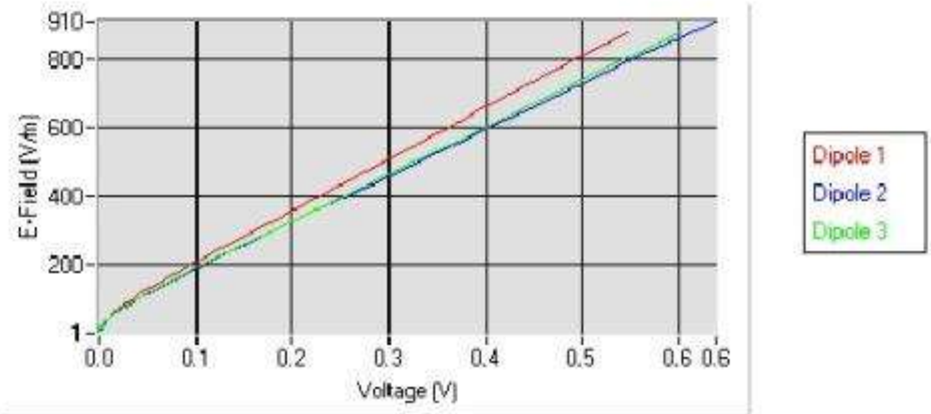
Normx dipole 1 ($\mu V/(V/m)^2$)	Normy dipole 2 ($\mu V/(V/m)^2$)	Normz dipole 3 ($\mu V/(V/m)^2$)
4.81	6.15	6.02

DCP dipole 1 (mV)	DCP dipole 2 (mV)	DCP dipole 3 (mV)
95	100	90

Calibration curves ei=f(V) (i=1,2,3) allow to obtain H-field value using the formula:

$$E = \sqrt{E_1^{\,2} + E_2^{\,2} + E_3^{\,2}}$$

Calibration curves



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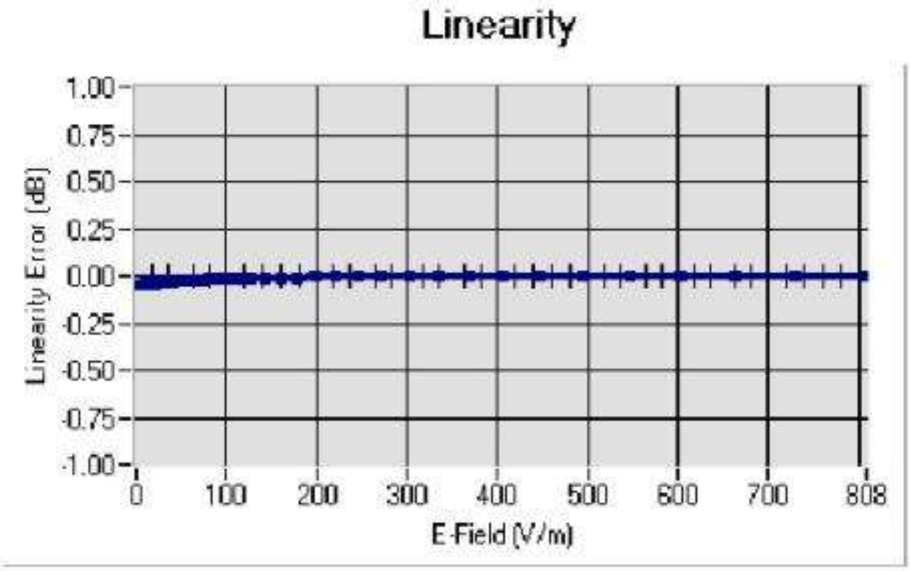
5.2 LINEARITY



Linearity: +/-1.16% (+/-0.05dB)

5.3 SENSITIVITY IN LIQUID

Liquid	Frequency (MHz +/- 100MHz)	Permittivity	Epsilon (S/m)	ConvF
HL450	450	43.90	0.87	4.84
BL450	450	58.63	0.98	4.98
HL750	750	42.06	0.89	4.53
BL750	750	56.57	0.99	4.70
HL850	835	42.81	0.89	4.83
BL850	835	53.46	0.96	5.02
HL900	900	42.47	0.96	4.74
BL900	900	56.69	1.08	4.89
HL1800	1800	41.31	1.38	4.25
BL1800	1800	53.27	1.51	4.34
HL1900	1900	41.09	1.42	4.71
BL1900	1900	54.20	1.54	4.85
HL2000	2000	39.72	1.43	4.27
BL2000	2000	53.91	1.53	4.44
HL2450	2450	39.05	1.77	4.11
BL2450	2450	52.97	1.93	4.25
HL2600	2600	38.35	1.92	4.20
BL2600	2600	51.81	2.19	4.32

LOWER DETECTION LIMIT: 7mW/kg

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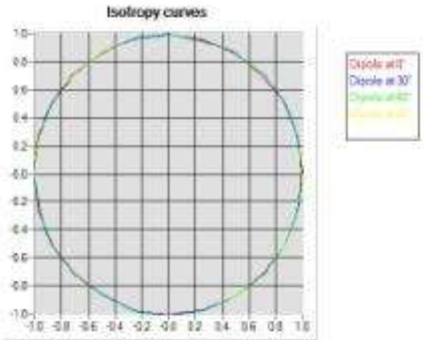
5.4 ISOTROPY

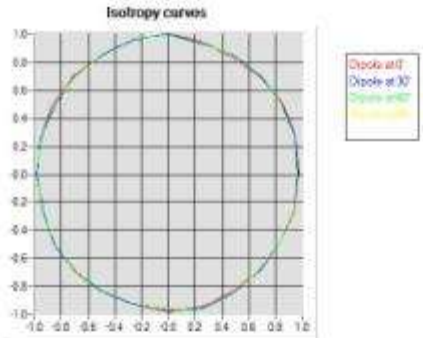
HL900 MHz

- Axial isotropy: 0.04 dB
- Hemispherical isotropy: 0.07 dB



HL1800 MHz

- Axial isotropy: 0.05 dB
- Hemispherical isotropy: 0.08 dB



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6 LIST OF EQUIPMENT

Equipment Summary Sheet				
Equipment Description	**Manufacturer / Model**	**Identification No.**	**Current Calibration Date**	**Next Calibration Date**
Flat Phantom	Satimo	SN-20/09-SAM71	Validated. No cal required.	Validated. No cal required.
COMOSAR Test Bench	Version 3	NA	Validated. No cal required.	Validated. No cal required.
Network Analyzer	Rhode & Schwarz ZVA	SN100132	02/2013	02/2016
Reference Probe	Satimo	EP 94 SN 37/08	10/2015	10/2016
Multimeter	Keithley 2000	1188656	12/2013	12/2016
Signal Generator	Agilent E4438C	MY49070581	12/2013	12/2016
Amplifier	Aethercomm	SN 046	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Power Meter	HP E4418A	US38261498	12/2013	12/2016
Power Sensor	HP ECP-E26A	US37181460	12/2013	12/2016
Directional Coupler	Narda 4216-20	01386	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Waveguide	Mega Industries	069Y7-158-13-712	Validated. No cal required.	Validated. No cal required.
Waveguide Transition	Mega Industries	069Y7-158-13-701	Validated. No cal required.	Validated. No cal required.
Waveguide Termination	Mega Industries	069Y7-158-13-701	Validated. No cal required.	Validated. No cal required.
Temperature / Humidity Sensor	Control Company	11-661-9	8/2013	8/2016

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5.3 SID835Dipole Calibration Ceriticate

SATIMO
The microwave vision company

SAR Reference Dipole Calibration Report

Ref : ACR.287.4.14.SATU.A

SHENZHEN LCS COMPLIANCE TESTING LABORATORY LTD.
1F., XINGYUAN INDUSTRIAL PARK, TONGDA ROAD, BAO'AN BLVD
BAO'AN DISTRICT, SHENZHEN, GUANGDONG, CHINA
SATIMO COMOSAR REFERENCE DIPOLE
FREQUENCY: 835 MHZ
SERIAL NO.: SN 07/14 DIP 0G835-303

Calibrated at SATIMO US
2105 Barrett Park Dr. - Kennesaw, GA 30144

ilac-MRA
A2LA ACCREDITED
Calibration CERT #2248-01

10/01/2015

Summary:

This document presents the method and results from an accredited SAR reference dipole calibration performed in SATIMO USA using the COMOSAR test bench. All calibration results are traceable to national metrology institutions.

SATIMO **SAR REFERENCE DIPOLE CALIBRATION REPORT** Ref: ACR.287.4.14.SATU.A

	Name	Function	Date	Signature
Prepared by :	Jérôme LUC	Product Manager	10/14/2015	
Checked by :	Jérôme LUC	Product Manager	10/14/2015	
Approved by :	Kim RUTKOWSKI	Quality Manager	10/14/2015	Kim Rutkowski

	Customer Name
Distribution :	Shenzhen LCS Compliance Testing Laboratory Ltd.

Issue	Date	Modifications
A	10/14/2015	Initial release

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1 INTRODUCTION

This document contains a summary of the requirements set forth by the IEEE 1528, OET 65 Bulletin C and CEI/IEC 62209 standards for reference dipoles used for SAR measurement system validations and the measurements that were performed to verify that the product complies with the fore mentioned standards.

2 DEVICE UNDER TEST

Device Under Test	
Device Type	COMOSAR 835 MHz REFERENCE DIPOLE
Manufacturer	Satimo
Model	SID835
Serial Number	SN 07/14 DIP 0G835-303
Product Condition (new / used)	New

A yearly calibration interval is recommended.

3 PRODUCT DESCRIPTION

3.1 GENERAL INFORMATION

Satimo's COMOSAR Validation Dipoles are built in accordance to the IEEE 1528, OET 65 Bulletin C and CEI/IEC 62209 standards. The product is designed for use with the COMOSAR test bench only.

Figure 1 – *Satimo COMOSAR Validation Dipole*

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4 MEASUREMENT METHOD

The IEEE 1528, OET 65 Bulletin C and CEI/IEC 62209 standards provide requirements for reference dipoles used for system validation measurements. The following measurements were performed to verify that the product complies with the fore mentioned standards.

4.1 RETURN LOSS REQUIREMENTS

The dipole used for SAR system validation measurements and checks must have a return loss of -20 dB or better. The return loss measurement shall be performed against a liquid filled flat phantom, with the phantom constucted as outlined in the fore mentioned standards.

4.2 MECHANICAL REQUIREMENTS

The IEEE Std. 1528 and CEI/IEC 62209 standards specify the mechanical components and dimensions of the validation dipoles, with the dimensions frequency and phantom shell thickness dependent. The COMOSAR test bench employs a 2 mm phantom shell thickness therefore the dipoles sold for use with the COMOSAR test bench comply with the requirements set forth for a 2 mm phantom shell thickness.

5 MEASUREMENT UNCERTAINTY

All uncertainties listed below represent an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2, traceable to the Internationally Accepted Guides to Measurement Uncertainty.

5.1 RETURN LOSS

The following uncertainties apply to the return loss measurement:

Frequency band	Expanded Uncertainty on Return Loss
400-6000MHz	0.1 dB

5.2 DIMENSION MEASUREMENT

The following uncertainties apply to the dimension measurements:

Length (mm)	Expanded Uncertainty on Length
3 - 300	0.05 mm

5.3 VALIDATION MEASUREMENT

The guidelines outlined in the IEEE 1528, OET 65 Bulletin C, CENELEC EN50361 and CEI/IEC 62209 standards were followed to generate the measurement uncertainty for validation measurements.

Scan Volume	Expanded Uncertainty
1 g	20.3 %
10 g	20.1 %

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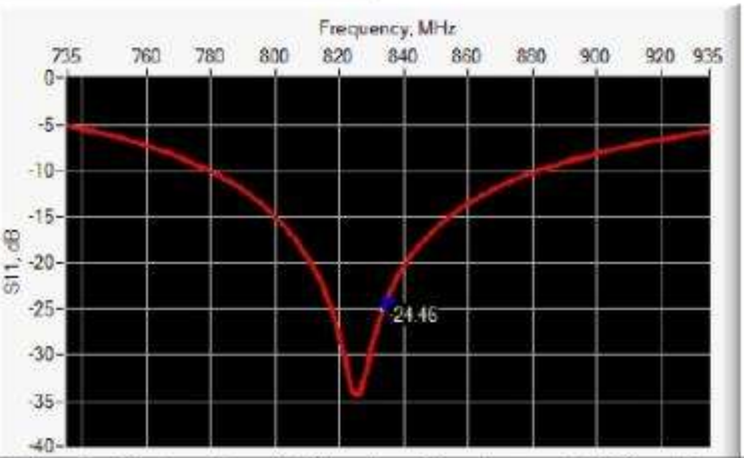
SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.287.4.14.SATU.A

6 CALIBRATION MEASUREMENT RESULTS

6.1 RETURN LOSS AND IMPEDANCE



Frequency (MHz)	Return Loss (dB)	Requirement (dB)	Impedance
835	-24.46	-20	55.4 Ω + 2.4 jΩ

6.2 MECHANICAL DIMENSIONS

Frequency MHz	L mm		h mm		d mm	
	required	measured	required	measured	required	measured
300	420.0 ±1 %.		250.0 ±1 %.		6.35 ±1 %.	
450	290.0 ±1 %.		166.7 ±1 %.		6.35 ±1 %.	
750	176.0 ±1 %.		100.0 ±1 %.		6.35 ±1 %.	
835	161.0 ±1 %.	PASS	89.8 ±1 %.	PASS	3.6 ±1 %.	PASS
900	149.0 ±1 %.		83.3 ±1 %.		3.6 ±1 %.	
1450	89.1 ±1 %.		51.7 ±1 %.		3.6 ±1 %.	
1500	80.5 ±1 %.		50.0 ±1 %.		3.6 ±1 %.	
1640	79.0 ±1 %.		45.7 ±1 %.		3.6 ±1 %.	
1750	75.2 ±1 %.		42.9 ±1 %.		3.6 ±1 %.	
1800	72.0 ±1 %.		41.7 ±1 %.		3.6 ±1 %.	
1900	68.0 ±1 %.		39.5 ±1 %.		3.6 ±1 %.	
1950	66.3 ±1 %.		38.5 ±1 %.		3.6 ±1 %.	
2000	64.5 ±1 %.		37.5 ±1 %.		3.6 ±1 %.	
2100	61.0 ±1 %.		35.7 ±1 %.		3.6 ±1 %.	
2300	55.5 ±1 %.		32.6 ±1 %.		3.6 ±1 %.	
2450	51.5 ±1 %.		30.4 ±1 %.		3.6 ±1 %.	
2600	48.5 ±1 %.		28.8 ±1 %.		3.6 ±1 %.	
3000	41.5 ±1 %.		25.0 ±1 %.		3.6 ±1 %.	
3500	37.0±1 %.		26.4 ±1 %.		3.6 ±1 %.	
3700	34.7±1 %.		26.4 ±1 %.		3.6 ±1 %.	

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7 VALIDATION MEASUREMENT

The IEEE Std. 1528, OET 65 Bulletin C and CEI/IEC 62209 standards state that the system validation measurements must be performed using a reference dipole meeting the fore mentioned return loss and mechanical dimension requirements. The validation measurement must be performed against a liquid filled flat phantom, with the phantom constructed as outlined in the fore mentioned standards. Per the standards, the dipole shall be positioned below the bottom of the phantom, with the dipole length centered and parallel to the longest dimension of the flat phantom, with the top surface of the dipole at the described distance from the bottom surface of the phantom.

7.1 HEAD LIQUID MEASUREMENT

Frequency MHz	Relative permittivity (ε_r')		Conductivity (σ) S/m	
	required	measured	required	measured
300	45.3 ±5 %		0.87 ±5 %	
450	43.5 ±5 %		0.87 ±5 %	
750	41.9 ±5 %		0.89 ±5 %	
835	41.5 ±5 %	PASS	0.90 ±5 %	PASS
900	41.5 ±5 %		0.97 ±5 %	
1450	40.5 ±5 %		1.20 ±5 %	
1500	40.4 ±5 %		1.23 ±5 %	
1640	40.2 ±5 %		1.31 ±5 %	
1750	40.1 ±5 %		1.37 ±5 %	
1800	40.0 ±5 %		1.40 ±5 %	
1900	40.0 ±5 %		1.40 ±5 %	
1950	40.0 ±5 %		1.40 ±5 %	
2000	40.0 ±5 %		1.40 ±5 %	
2100	39.8 ±5 %		1.49 ±5 %	
2300	39.5 ±5 %		1.67 ±5 %	
2450	39.2 ±5 %		1.80 ±5 %	
2600	39.0 ±5 %		1.96 ±5 %	
3000	38.5 ±5 %		2.40 ±5 %	
3500	37.9 ±5 %		2.91 ±5 %	

7.2 SAR MEASUREMENT RESULT WITH HEAD LIQUID

The IEEE Std. 1528 and CEI/IEC 62209 standards state that the system validation measurements should produce the SAR values shown below (for phantom thickness of 2 mm), within the uncertainty for the system validation. All SAR values are normalized to 1 W forward power. In bracket, the measured SAR is given with the used input power.

Software	OPENSAR V4
Phantom	SN 20/09 SAM71
Probe	SN 18/11 EPG122
Liquid	Head Liquid Values: eps' : 42.3 sigma : 0.92
Distance between dipole center and liquid	15.0 mm
Area scan resolution	dx=8mm/dy=8mm

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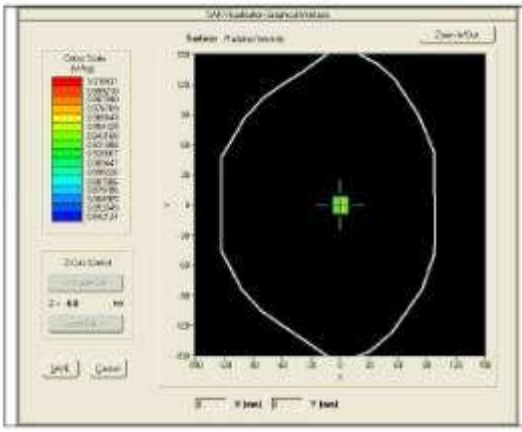
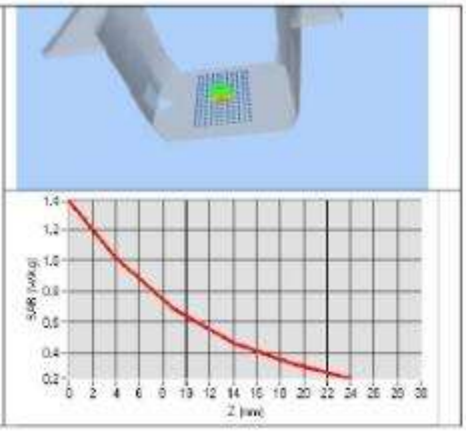
SATIMO **SAR REFERENCE DIPOLE CALIBRATION REPORT** Ref: ACR.287.4.14.SATU.A

Zoon Scan Resolution	dx=8mm/dy=8m/dz=5mm
Frequency	835 MHz
Input power	20 dBm
Liquid Temperature	21 °C
Lab Temperature	21 °C
Lab Humidity	45 %

Frequency MHz	1 g SAR (W/kg/W)		10 g SAR (W/kg/W)	
	required	measured	required	measured
300	2.85		1.94	
450	4.58		3.06	
750	8.49		5.55	
835	9.56	9.60 (0.96)	6.22	6.20 (0.62)
900	10.9		6.99	
1450	29		16	
1500	30.5		16.8	
1640	34.2		18.4	
1750	36.4		19.3	
1800	38.4		20.1	
1900	39.7		20.5	
1950	40.5		20.9	
2000	41.1		21.1	
2100	43.6		21.9	
2300	48.7		23.3	
2450	52.4		24	
2600	55.3		24.6	
3000	63.8		25.7	
3500	67.1		25	





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7.3 BODY LIQUID MEASUREMENT

Frequency MHz	Relative permittivity (ε,')		Conductivity (σ) S/m	
	required	measured	required	measured
150	61.9 ±5 %		0.80 ±5 %	
300	58.2 ±5 %		0.92 ±5 %	
450	56.7 ±5 %		0.94 ±5 %	
750	55.5 ±5 %		0.96 ±5 %	
835	55.2 ±5 %	PASS	0.97 ±5 %	PASS
900	55.0 ±5 %		1.05 ±5 %	
915	55.0 ±5 %		1.06 ±5 %	
1450	54.0 ±5 %		1.30 ±5 %	
1610	53.8 ±5 %		1.40 ±5 %	
1800	53.3 ±5 %		1.52 ±5 %	
1900	53.3 ±5 %		1.52 ±5 %	
2000	53.3 ±5 %		1.52 ±5 %	
2100	53.2 ±5 %		1.62 ±5 %	
2450	52.7 ±5 %		1.95 ±5 %	
2600	52.5 ±5 %		2.16 ±5 %	
3000	52.0 ±5 %		2.73 ±5 %	
3500	51.3 ±5 %		3.31 ±5 %	
5200	49.0 ±10 %		5.30 ±10 %	
5300	48.9 ±10 %		5.42 ±10 %	
5400	48.7 ±10 %		5.53 ±10 %	
5500	48.6 ±10 %		5.65 ±10 %	
5600	48.5 ±10 %		5.77 ±10 %	
5800	48.2 ±10 %		6.00 ±10 %	

7.4 SAR MEASUREMENT RESULT WITH BODY LIQUID

Software	OPENSAR V4
Phantom	SN 20/09 SAM71
Probe	SN 18/11 EPG122
Liquid	Body Liquid Values: eps' : 54.1 sigma : 0.97
Distance between dipole center and liquid	15.0 mm
Area scan resolution	dx=8mm/dy=8mm
Zoon Scan Resolution	dx=8mm/dy=8m/dz=5mm
Frequency	835 MHz
Input power	20 dBm
Liquid Temperature	21 °C
Lab Temperature	21 °C
Lab Humidity	45 %

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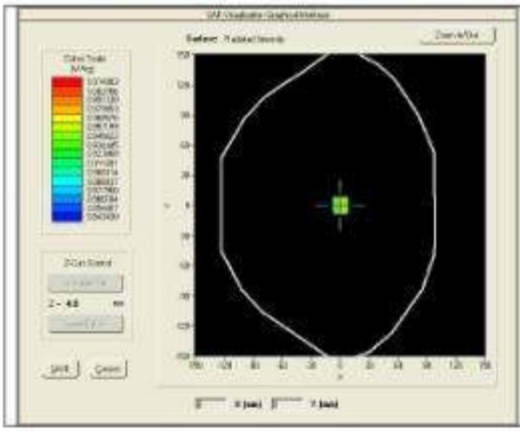
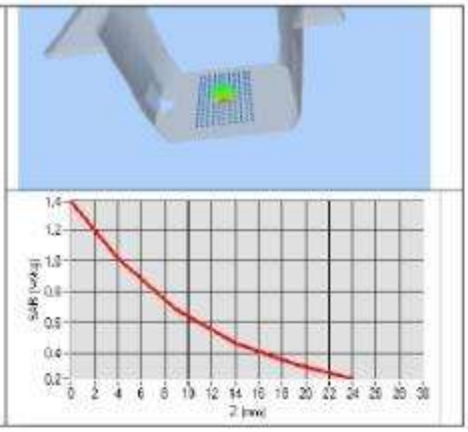
Frequency MHz	1 g SAR (W/kg/W)	10 g SAR (W/kg/W)
	measured	measured
835	9.90 (0.99)	6.39 (0.64)





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8 LIST OF EQUIPMENT

Equipment Summary Sheet				
Equipment Description	**Manufacturer / Model**	**Identification No.**	**Current Calibration Date**	**Next Calibration Date**
SAM Phantom	Satimo	SN-20/09-SAM71	Validated. No cal required.	Validated. No cal required.
COMOSAR Test Bench	Version 3	NA	Validated. No cal required.	Validated. No cal required.
Network Analyzer	Rhode & Schwarz ZVA	SN100132	02/2013	02/2016
Calipers	Carrera	CALIPER-01	12/2013	12/2016
Reference Probe	Satimo	EPG122 SN 18/11	10/2015	10/2016
Multimeter	Keithley 2000	1188656	12/2013	12/2016
Signal Generator	Agilent E4438C	MY49070581	12/2013	12/2016
Amplifier	Aethercomm	SN 046	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Power Meter	HP E4418A	US38261498	12/2013	12/2016
Power Sensor	HP ECP-E26A	US37181460	12/2013	12/2016
Directional Coupler	Narda 4216-20	01386	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Temperature and Humidity Sensor	Control Company	11-661-9	8/2013	8/2016

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5.4 SID1900 Dipole Calibration Ceriticate

COMOSAR E-Field Probe Calibration Report

Ref : ACR.262.8.14.SATU.A

SHENZHEN LCS COMPLIANCE TESTING LABORATORY LTD.
1F., XINGYUAN INDUSTRIAL PARK,TONGDA ROAD, BAO'AN BLVD
BAO'AN DISTRICT, SHENZHEN, GUANGDONG,CHINA
SATIMO COMOSAR DOSIMETRIC E-FIELD PROBE
FREQUENCY:1900MHz
SERIAL NO.: SN 30/14 DIP1G900-333

Calibrated at SATIMO US
2105 Barrett Park Dr. - Kennesaw, GA 30144

10/01/2015

Summary:

This document presents the method and results from an accredited COMOSAR Dosimetric E-Field Probe calibration performed in SATIMO USA using the CALISAR / CALIBAIR test bench, for use with a SATIMO COMOSAR system only. All calibration results are traceable to national metrology institutions.

	Name	Function	Date	Signature
Prepared by :	Jérôme LUC	Product Manager	10/14/2015	
Checked by :	Jérôme LUC	Product Manager	10/14/2015	
Approved by :	Kim RUTKOWSKI	Quality Manager	10/14/2015	Kim Rutkowski

	Customer Name
Distribution :	Shenzhen LCS Compliance Testing Laboratory Ltd.

Issue	Date	Modifications
A	10/14/2015	Initial release

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1 INTRODUCTION

This document contains a summary of the requirements set forth by the IEEE 1528, OET 65 Bulletin C and CEI/IEC 62209 standards for reference dipoles used for SAR measurement system validations and the measurements that were performed to verify that the product complies with the fore mentioned standards.

2 DEVICE UNDER TEST

Device Under Test	
Device Type	COMOSAR 1900 MHz REFERENCE DIPOLE
Manufacturer	Satimo
Model	SID1900
Serial Number	SN 30/14 DIP1G900-333
Product Condition (new / used)	New

A yearly calibration interval is recommended.

3 PRODUCT DESCRIPTION

3.1 GENERAL INFORMATION

Satimo's COMOSAR Validation Dipoles are built in accordance to the IEEE 1528, OET 65 Bulletin C and CEI/IEC 62209 standards. The product is designed for use with the COMOSAR test bench only.

Figure 1 – *Satimo COMOSAR Validation Dipole*

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4 MEASUREMENT METHOD

The IEEE 1528, OET 65 Bulletin C and CEI/IEC 62209 standards provide requirements for reference dipoles used for system validation measurements. The following measurements were performed to verify that the product complies with the fore mentioned standards.

4.1 RETURN LOSS REQUIREMENTS

The dipole used for SAR system validation measurements and checks must have a return loss of -20 dB or better. The return loss measurement shall be performed against a liquid filled flat phantom, with the phantom constucted as outlined in the fore mentioned standards.

4.2 MECHANICAL REQUIREMENTS

The IEEE Std. 1528 and CEI/IEC 62209 standards specify the mechanical components and dimensions of the validation dipoles, with the dimensions frequency and phantom shell thickness dependent. The COMOSAR test bench employs a 2 mm phantom shell thickness therefore the dipoles sold for use with the COMOSAR test bench comply with the requirements set forth for a 2 mm phantom shell thickness.

5 MEASUREMENT UNCERTAINTY

All uncertainties listed below represent an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2, traceable to the Internationally Accepted Guides to Measurement Uncertainty.

5.1 RETURN LOSS

The following uncertainties apply to the return loss measurement:

Frequency band	Expanded Uncertainty on Return Loss
400-6000MHz	0.1 dB

5.2 DIMENSION MEASUREMENT

The following uncertainties apply to the dimension measurements:

Length (mm)	Expanded Uncertainty on Length
3 - 300	0.05 mm

5.3 VALIDATION MEASUREMENT

The guidelines outlined in the IEEE 1528, OET 65 Bulletin C, CENELEC EN50361 and CEI/IEC 62209 standards were followed to generate the measurement uncertainty for validation measurements.

Scan Volume	Expanded Uncertainty
1 g	20.3 %
10 g	20.1 %

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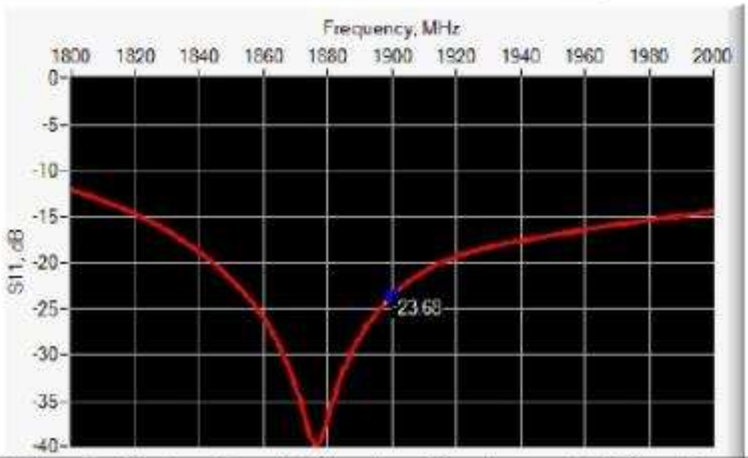
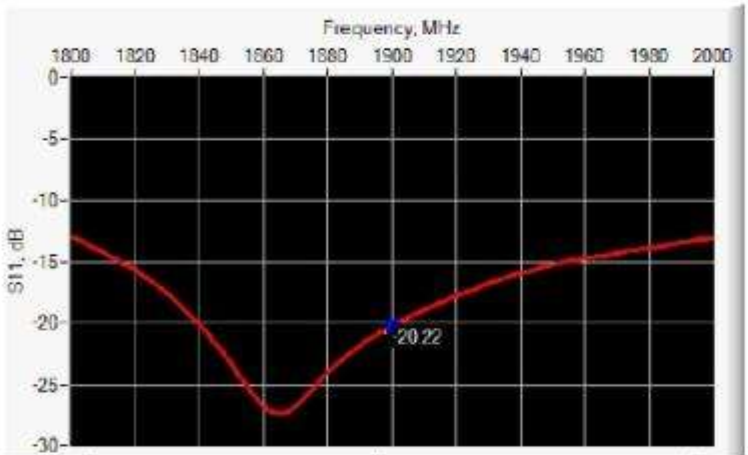
6 CALIBRATION MEASUREMENT RESULTS

6.1 RETURN LOSS AND IMPEDANCE IN HEAD LIQUID



Frequency (MHz)	Return Loss (dB)	Requirement (dB)	Impedance
1900	-23.68	-20	51.2 Ω + 6.4 jΩ

6.2 RETURN LOSS AND IMPEDANCE IN BODY LIQUID



Frequency (MHz)	Return Loss (dB)	Requirement (dB)	Impedance
1900	-20.22	-20	48.8 Ω + 9.6 jΩ

6.3 MECHANICAL DIMENSIONS

Frequency MHz	L mm		h mm		d mm	
	required	measured	required	measured	required	measured
300	420.0 ±1 %.		250.0 ±1 %.		6.35 ±1 %.	
450	290.0 ±1 %.		166.7 ±1 %.		6.35 ±1 %.	
750	176.0 ±1 %.		100.0 ±1 %.		6.35 ±1 %.	
835	161.0 ±1 %.		89.8 ±1 %.		3.6 ±1 %.	

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900	149.0 ±1 %.		83.3 ±1 %.		3.6 ±1 %.	
1450	89.1 ±1 %.		51.7 ±1 %.		3.6 ±1 %.	
1500	80.5 ±1 %.		50.0 ±1 %.		3.6 ±1 %.	
1640	79.0 ±1 %.		45.7 ±1 %.		3.6 ±1 %.	
1750	75.2 ±1 %.		42.9 ±1 %.		3.6 ±1 %.	
1800	72.0 ±1 %.		41.7 ±1 %.		3.6 ±1 %.	
1900	68.0 ±1 %.	PASS	39.5 ±1 %.	PASS	3.6 ±1 %.	PASS
1950	66.3 ±1 %.		38.5 ±1 %.		3.6 ±1 %.	
2000	64.5 ±1 %.		37.5 ±1 %.		3.6 ±1 %.	
2100	61.0 ±1 %.		35.7 ±1 %.		3.6 ±1 %.	
2300	55.5 ±1 %.		32.6 ±1 %.		3.6 ±1 %.	
2450	51.5 ±1 %.		30.4 ±1 %.		3.6 ±1 %.	
2600	48.5 ±1 %.		28.8 ±1 %.		3.6 ±1 %.	
3000	41.5 ±1 %.		25.0 ±1 %.		3.6 ±1 %.	
3500	37.0±1 %.		26.4 ±1 %.		3.6 ±1 %.	
3700	34.7±1 %.		26.4 ±1 %.		3.6 ±1 %.	

7 VALIDATION MEASUREMENT

The IEEE Std. 1528, OET 65 Bulletin C and CEI/IEC 62209 standards state that the system validation measurements must be performed using a reference dipole meeting the fore mentioned return loss and mechanical dimension requirements. The validation measurement must be performed against a liquid filled flat phantom, with the phantom constructed as outlined in the fore mentioned standards. Per the standards, the dipole shall be positioned below the bottom of the phantom, with the dipole length centered and parallel to the longest dimension of the flat phantom, with the top surface of the dipole at the described distance from the bottom surface of the phantom.

7.1 HEAD LIQUID MEASUREMENT

Frequency MHz	Relative permittivity (ε_r')		Conductivity (σ) S/m	
	required	measured	required	measured
300	45.3 ±5 %		0.87 ±5 %	
450	43.5 ±5 %		0.87 ±5 %	
750	41.9 ±5 %		0.89 ±5 %	
835	41.5 ±5 %		0.90 ±5 %	
900	41.5 ±5 %		0.97 ±5 %	
1450	40.5 ±5 %		1.20 ±5 %	
1500	40.4 ±5 %		1.23 ±5 %	
1640	40.2 ±5 %		1.31 ±5 %	
1750	40.1 ±5 %		1.37 ±5 %	
1800	40.0 ±5 %		1.40 ±5 %	
1900	40.0 ±5 %	PASS	1.40 ±5 %	PASS
1950	40.0 ±5 %		1.40 ±5 %	
2000	40.0 ±5 %		1.40 ±5 %	

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2100	39.8 ±5 %		1.49 ±5 %	
2300	39.5 ±5 %		1.67 ±5 %	
2450	39.2 ±5 %		1.80 ±5 %	
2600	39.0 ±5 %		1.96 ±5 %	
3000	38.5 ±5 %		2.40 ±5 %	
3500	37.9 ±5 %		2.91 ±5 %	

7.2 SAR MEASUREMENT RESULT WITH HEAD LIQUID

The IEEE Std. 1528 and CEI/IEC 62209 standards state that the system validation measurements should produce the SAR values shown below (for phantom thickness of 2 mm), within the uncertainty for the system validation. All SAR values are normalized to 1 W forward power. In bracket, the measured SAR is given with the used input power.

Software	OPENSAR V4
Phantom	SN 20/09 SAM71
Probe	SN 18/11 EPG122
Liquid	Head Liquid Values: eps' : 41.1 sigma : 1.42
Distance between dipole center and liquid	10.0 mm
Area scan resolution	dx=8mm/dy=8mm
Zoon Scan Resolution	dx=8mm/dy=8m/dz=5mm
Frequency	1900 MHz
Input power	20 dBm
Liquid Temperature	21 °C
Lab Temperature	21 °C
Lab Humidity	45 %

Frequency MHz	1 g SAR (W/kg/W)		10 g SAR (W/kg/W)	
	required	measured	required	measured
300	2.85		1.94	
450	4.58		3.06	
750	8.49		5.55	
835	9.56		6.22	
900	10.9		6.99	
1450	29		16	
1500	30.5		16.8	
1640	34.2		18.4	
1750	36.4		19.3	
1800	38.4		20.1	
1900	39.7	39.84 (3.98)	20.5	20.20 (2.02)
1950	40.5		20.9	
2000	41.1		21.1	
2100	43.6		21.9	
2300	48.7		23.3	

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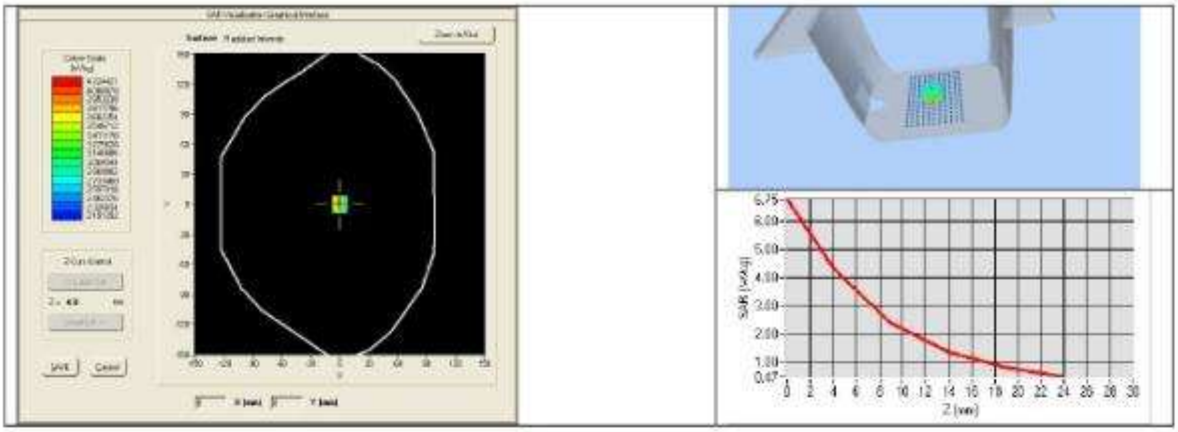
2450	52.4		24	
2600	55.3		24.6	
3000	63.8		25.7	
3500	67.1		25	



7.3 BODY LIQUID MEASUREMENT

Frequency MHz	Relative permittivity (ε_r')		Conductivity (σ) S/m	
	required	measured	required	measured
150	61.9 ±5 %		0.80 ±5 %	
300	58.2 ±5 %		0.92 ±5 %	
450	56.7 ±5 %		0.94 ±5 %	
750	55.5 ±5 %		0.96 ±5 %	
835	55.2 ±5 %		0.97 ±5 %	
900	55.0 ±5 %		1.05 ±5 %	
915	55.0 ±5 %		1.06 ±5 %	
1450	54.0 ±5 %		1.30 ±5 %	
1610	53.8 ±5 %		1.40 ±5 %	
1800	53.3 ±5 %		1.52 ±5 %	
1900	53.3 ±5 %	PASS	1.52 ±5 %	PASS
2000	53.3 ±5 %		1.52 ±5 %	
2100	53.2 ±5 %		1.62 ±5 %	
2450	52.7 ±5 %		1.95 ±5 %	
2600	52.5 ±5 %		2.16 ±5 %	
3000	52.0 ±5 %		2.73 ±5 %	
3500	51.3 ±5 %		3.31 ±5 %	
5200	49.0 ±10 %		5.30 ±10 %	
5300	48.9 ±10 %		5.42 ±10 %	
5400	48.7 ±10 %		5.53 ±10 %	

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SAR REFERENCE DIPOLE CALIBRATION REPORT

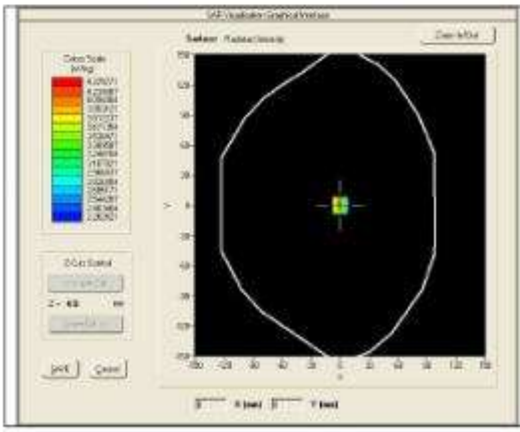
Ref: ACR.262.8.14.SATU.A

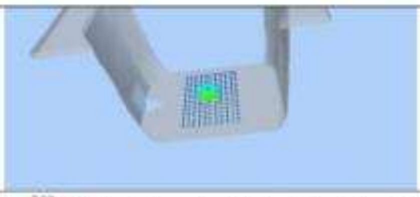
5500	48.6 ±10 %		5.65 ±10 %	
5600	48.5 ±10 %		5.77 ±10 %	
5800	48.2 ±10 %		6.00 ±10 %	

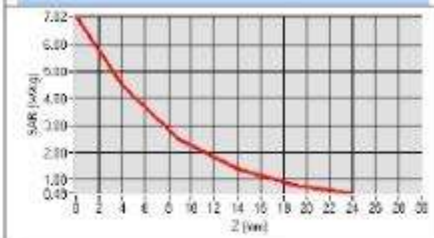
7.4 SAR MEASUREMENT RESULT WITH BODY LIQUID

Software	OPENSAR V4
Phantom	SN 20/09 SAM71
Probe	SN 18/11 EPG122
Liquid	Body Liquid Values: eps' : 54.2 sigma : 1.54
Distance between dipole center and liquid	10.0 mm
Area scan resolution	dx=8mm/dy=8mm
Zoon Scan Resolution	dx=8mm/dy=8m/dz=5mm
Frequency	1900 MHz
Input power	20 dBm
Liquid Temperature	21 °C
Lab Temperature	21 °C
Lab Humidity	45 %

Frequency MHz	1 g SAR (W/kg/W)	10 g SAR (W/kg/W)
	measured	measured
1900	43.33 (4.33)	21.59 (2.16)







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8 LIST OF EQUIPMENT

Equipment Summary Sheet				
Equipment Description	**Manufacturer / Model**	**Identification No.**	**Current Calibration Date**	**Next Calibration Date**
SAM Phantom	Satimo	SN-20/09-SAM71	Validated. No cal required.	Validated. No cal required.
COMOSAR Test Bench	Version 3	NA	Validated. No cal required.	Validated. No cal required.
Network Analyzer	Rhode & Schwarz ZVA	SN100132	02/2013	02/2016
Calipers	Carrera	CALIPER-01	12/2013	12/2016
Reference Probe	Satimo	EPG122 SN 18/11	10/2015	10/2016
Multimeter	Keithley 2000	1188656	12/2013	12/2016
Signal Generator	Agilent E4438C	MY49070581	12/2013	12/2016
Amplifier	Aethercomm	SN 046	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Power Meter	HP E4418A	US38261498	12/2013	12/2016
Power Sensor	HP ECP-E26A	US37181460	12/2013	12/2016
Directional Coupler	Narda 4216-20	01386	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Temperature and Humidity Sensor	Control Company	11-661-9	8/2013	8/2016

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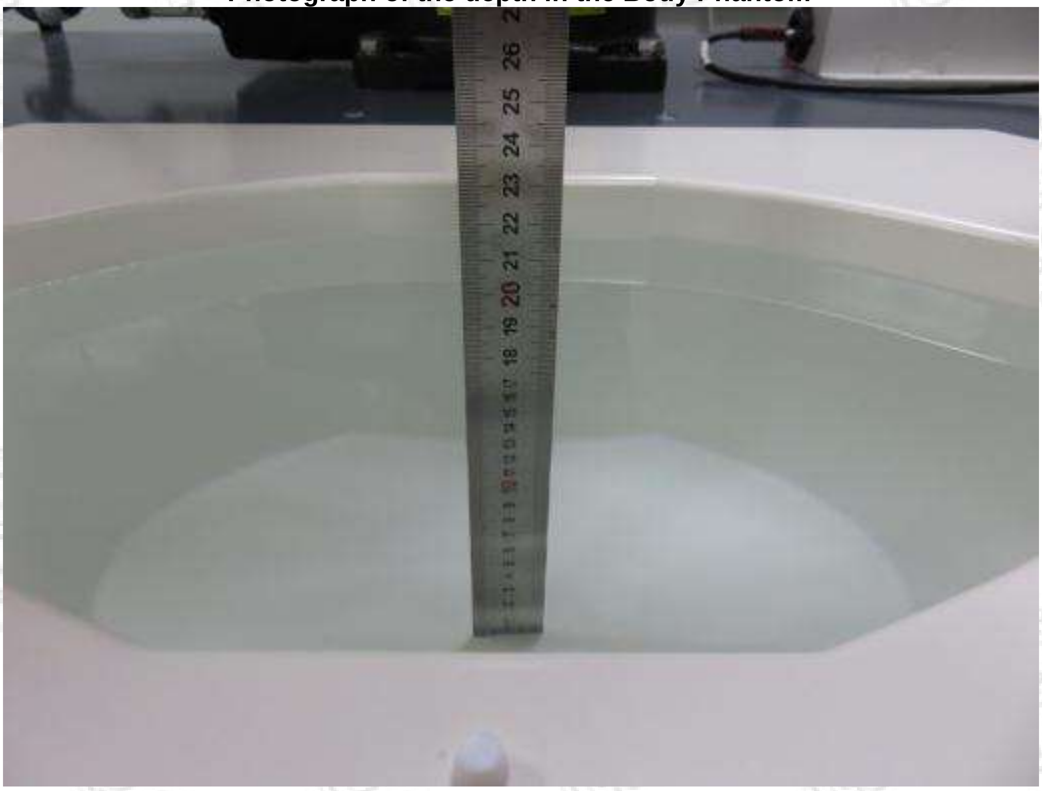
6.EUT TEST PHOTOGRAPHS

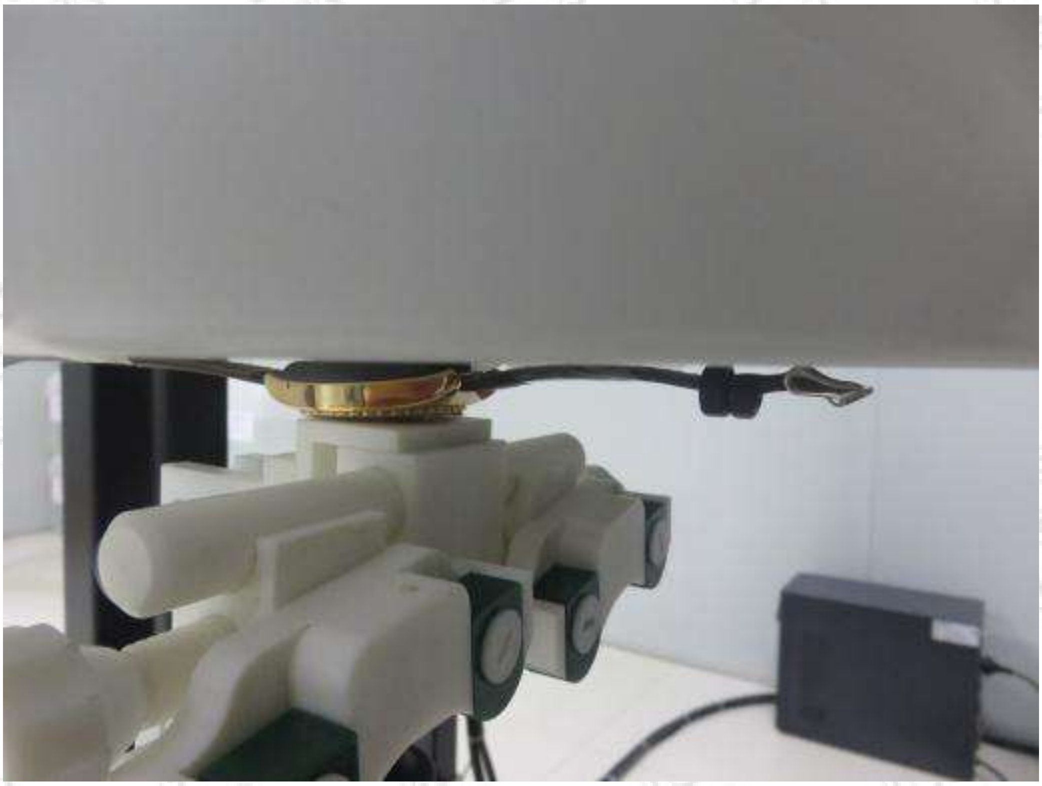
Photograph of the depth in the Head Phantom

Photograph of the depth in the Body Phantom



Next – to – Mouth Exposure Conditions
Flat / Front (10mm)

Extremity Exposure Conditions
Flat / Rear (0mm)



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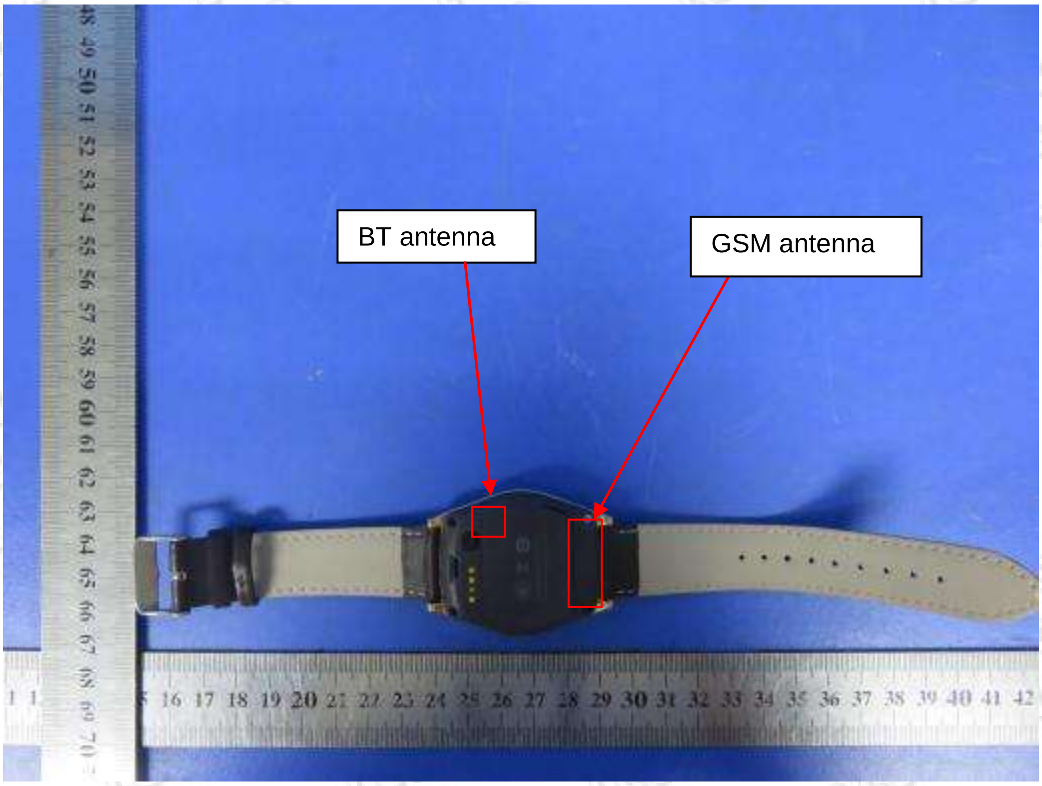
7.EUT Photographs



....................The End of Test Report.......................