SAR EVALUATION REPORT

For

Micron Electronics LLC.

1001 Yamato Road, Suite 400,Boca Raton, Florida, United States 33431

FCC ID: ZKQ-ATP4GA

Report Type:	**Product Type:**
Original Report	Tracker

Report Number:	RXZ181122003-23A
Report Date:	2019-1-16
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Radiofrequency radiation exposure evaluation: portable devices</td></tr>
<tr><td colspan="3">RSS-102 Issue 5 March 2015
Radio Frequency (RF) Exposure Compliance of Radio communication Apparatus (All Frequency Bands).</td></tr>
<tr><td colspan="3">IEEE1528:2013
IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques</td></tr>
<tr><td colspan="3">IEC 62209-2:2010
Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices-Human models, instrumentation, and procedures-Part 2: Procedure to determine the specific absorption rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)</td></tr>
<tr><td colspan="3">KDB procedures
KDB 447498 D01 General RF Exposure Guidance v06
KDB 865664 D01 SAR measurement 100 MHz to 6 GHz v01r04
KDB 865664 D02 RF Exposure Reporting v01r02
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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
1.0	RXZ181122003-23A	Original Report	2019-1-16

EUT DESCRIPTION

This report has been prepared on behalf of ***Micron Electronics LLC.*** and their product ***Tracker***, Model: ***AT Plus 4G***, FCC ID: ***2ZKQ-ATP4GA*** or the EUT (Equipment under Test) as referred to in the rest of this report.

Technical Specification

Device Type:	Portable
Exposure Category:	Population / Uncontrolled
Antenna Type(s):	Internal Antenna
Body-Worn Accessories:	Lanyard
Face-Head Accessories:	None
Operation Mode :	WLAN
Frequency Band:	WLAN: 2412 -2462/2422-2452 MHz
Conducted RF Power:	WLAN: 12.51 dBm
Dimensions (L*W*H):	Length (74.8 mm)*Width (42.5 mm)*High (27 mm)
Power Source:	DC 3.7V from Battery and DC 5V charging by Adapter
Normal Operation:	Face up and Body Worn

The EUT contain a 4G LTE module

Device Description:	LTE MODULE
Manufacturer:	TELIT COMMUNICATIONS SPA
Operation Mode :	LTE CAT M
ID Number:	FCC ID : RI7ME910C1NA
Frequency Band:	LTE Band 2: 1850-1910 MHz(TX) ; 1930-1990 MHz(RX) LTE Band 4: 1710-1755 MHz(TX) ; 2110-2155 MHz(RX) LTE Band 12: 699-716 MHz(TX) ; 729-746 MHz(RX)
Conducted RF Power:	LTE Band 2: 23.40 dBm LTE Band 4: 23.40 dBm LTE Band 12: 23.41 dBm

REFERENCE, STANDARDS, AND GUIDELINES

FCC:

The Report and Order requires routine SAR evaluation prior to equipment authorization of portable transmitter devices, including portable telephones. For consumer products, the applicable limit is 1.6 mW/g as recommended by the ANSI/IEEE standard C95.1-1992 [6] for an uncontrolled environment (Paragraph 65). According to the Supplement C of OET Bulletin 65 “Evaluating Compliance with FCC Guide-lines for Human Exposure to Radio frequency Electromagnetic Fields", released on Jun 29, 2001 by the FCC, the device should be evaluated at maximum output power (radiated from the antenna) under “worst-case” conditions for normal or intended use, incorporating normal antenna operating positions, device peak performance frequencies and positions for maximum RF energy coupling.

This report describes the methodology and results of experiments performed on wireless data terminal. The objective was to determine if there is RF radiation and if radiation is found, what is the extent of radiation with respect to safety limits. SAR (Specific Absorption Rate) is the measure of RF exposure determined by the amount of RF energy absorbed by human body (or its parts) – to determine how the RF energy couples to the body or head which is a primary health concern for body worn devices. The limit below which the exposure to RF is considered safe by regulatory bodies in North America is 1.6 mW/g average over 1 gram of tissue mass.

CE:

The order requires routine SAR evaluation prior to equipment authorization of portable transmitter devices, including portable telephones. For consumer products, the applicable limit is 2 mW/g as recommended by EN62209-1 for an uncontrolled environment. According to the Standard, the device should be evaluated at maximum output power (radiated from the antenna) under “worst-case” conditions for normal or intended use, incorporating normal antenna operating positions, device peak performance frequencies and positions for maximum RF energy coupling.

This report describes the methodology and results of experiments performed on wireless data terminal. The objective was to determine if there is RF radiation and if radiation is found, what is the extent of radiation with respect to safety limits. SAR (Specific Absorption Rate) is the measure of RF exposure determined by the amount of RF energy absorbed by human body (or its parts) – to determine how the RF energy couples to the body or head which is a primary health concern for body worn devices. The limit below which the exposure to RF is considered safe by regulatory bodies in Europe is 2 mW/g average over 10 gram of tissue mass.

The test configurations were laid out on a specially designed test fixture to ensure the reproducibility of measurements. Each configuration was scanned for SAR. Analysis of each scan was carried out to characterize the above effects in the device.

SAR Limits

FCC Limit

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

CE Limit

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 10 g of tissue)	2.0	10
Spatial Peak (hands/wrists/feet/ankles averaged over 10 g)	4.0	20.0

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

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

General Population/Uncontrolled environments Spatial Peak limit 1.6W/kg (FCC) & 2 W/kg (CE) applied to the EUT.

FACILITIES

The test site used by Bay Area Compliance Laboratories Corp. (Taiwan) to collect test data is located on
☒70, Lane 169, Sec. 2, Datong Road, Xizhi Dist., New Taipei City 22183, Taiwan, R.O.C.

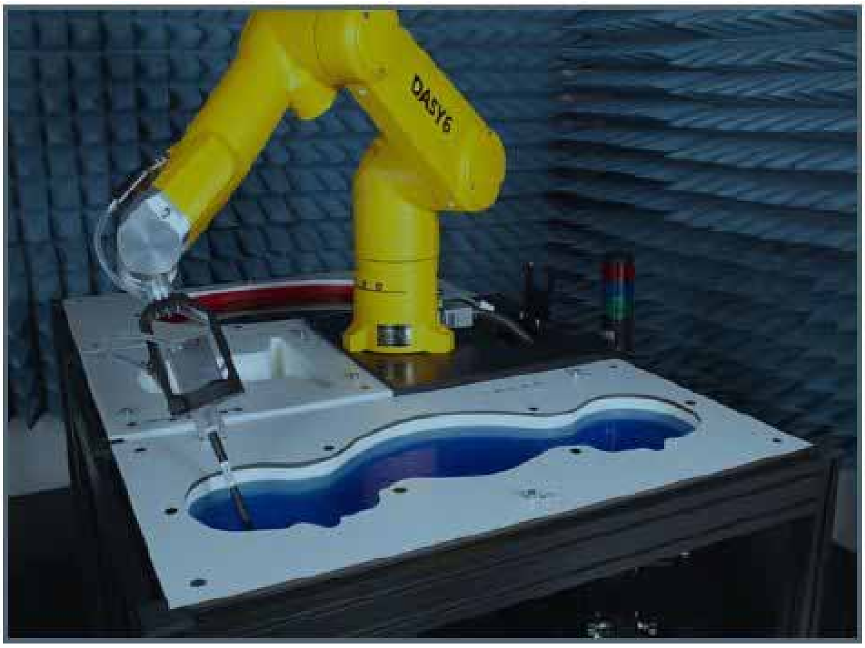
Test site at Bay Area Compliance Laboratories Corp. (Taiwan) has been fully described in reports submitted to the Federal Communication Commission (FCC). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on April 22, 2015. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2014.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 974454. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

Bay Area Compliance Laboratories Corp. (Taiwan) Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code: 3180), Please refer Exhibit E “Certificate and Scope of Accreditation of ISO/IEC 17025:2005 TAF Certificate”

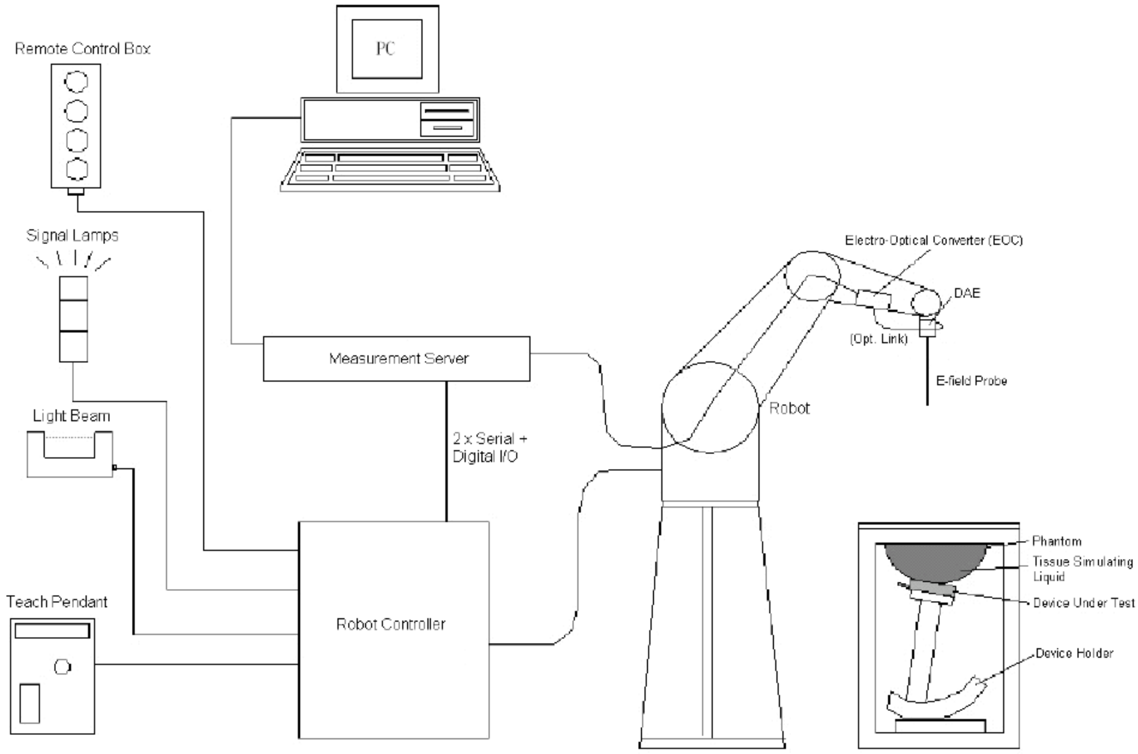
DESCRIPTION OF TEST SYSTEM

These measurements were performed with the automated near-field scanning system DASY6 from Schmid & Partner Engineering AG (SPEAG) which is the Fifth generation of the system shown in the figure hereinafter:



DASY6 System Description

The DASY6 system for performing compliance tests consists of the following items:



- A standard high precision 6-axis robot (Staubli TX=RX family) with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic field probe optimized and calibrated for the targeted measurement.
- A data acquisition electronics (DAE) which performs the signal application, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running Win7 professional operating system and the DASY52 software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- The phantom, the device holder and other accessories according to the targeted measurement.

DASY6 Measurement Server

The DASY6 measurement server is based on a PC/104 CPU board with a 400 MHz intel ULV Celeron, 128 MB chip-disk and 128 MB RAM. The necessary circuits for communication with the DAE4 (or DAE3) electronics box, as well as the 16-bit AD converter system for optical detection and digital I/O interface are contained on the DASY6 I/O board, which is directly connected to the PC/104 bus of the CPU board.

The measurement server performs all real-time data evaluations of field measurements and surface detection, controls robot movements, and handles safety operations. The PC operating system cannot interfere with these time-critical processes. All connections are supervised by a watchdog, and disconnection of any of the cables to the measurement server will automatically disarm the robot and disable all program-controlled robot movements. Furthermore, the measurement server is equipped with an expansion port, which is reserved for future applications. Please note that this expansion port does not have a standard- ized pinout, and therefore only devices provided by SPEAG can be connected. Connection of devices from any other supplier could seriously damage the measurement server.

Data Acquisition Electronics

The data acquisition electronics (DAE4) consist of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder with a control logic unit. Transmission to the measurement server is accomplished through an optical downlink for data and status information, as well as an optical uplink for commands and the clock.

The mechanical probe mounting device includes two different sensor systems for frontal and sideways probe contacts. They are used for mechanical surface detection and probe collision detection.

The input impedance of both the DAE4 as well as of the DAE3 box is 200MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.

EX3DV4 E-Field Probes

Frequency	10 MHz to > 6 GHz Linearity: ± 0.2 dB (30 MHz to 6 GHz)
Directivity	± 0.3 dB in TSL (rotation around probe axis) ± 0.5 dB in TSL (rotation normal to probe axis)
Dynamic Range	10 μW/g to > 100 mW/g Linearity: ± 0.2 dB (noise: typically < 1 μW/g)
Dimensions	Overall length: 337 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm
Application	High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields); the only probe that enables compliance testing for frequencies up to 6 GHz with precision of better 30%.
Compatibility	DASY3, DASY4, DASY52 SAR and higher, EASY4/MRI

SAM Twin Phantom

The SAM Twin Phantom (shown in front of DASY6) is a fiberglass shell phantom with shell thickness 2 mm, except in the ear region where the thickness is increased to 6 mm. The phantom has three mea- surement areas: 1) Left Head, 2) Right Head, and 3) Flat Section. For larger de- vices, the use of the ELI-Phantom (shown behind DASY6) is required. For devices such as glasses with a wireless link, the Face Down Phantom is the most suitable (between the SAM Twin and ELI phan- toms).

When the phantom is mounted inside allocated slot of the DASY6 platform, phanotm reference points can be taught directly in the DASY5 V5.2software. When the DASY6 platform is used to mount the

phantom, some of the phantom teaching points cannot be reached by the robot in DASY5 V5.2. A special tool called P1a-P2aX-Former is provided to transform two of the three points, P1 and P2, to reachable locations. To use these new teaching points, a revised phantom configuration file is required.
In addition to our standard broadband liquids, the phantom can be used with the following tissue simu- lating liquids:

Sugar-water-based liquids can be left permanently in the phantom. Always cover the liquid when the system is not in use to prevent changes in liquid parameters due to water evaporation.
DGBE-based liquids should be used with care. As DGBE is a softener for most plastics, the liquid should be taken out of the phantom, and the phantom should be dried when the system is not in use (desirable at least once a week).

•Do not use other organic solvents without previously testing the solvent resistivity of the phantom.
Approximately 25 liters of liquid is required to fill the SAM Twin phantom.

Tissue Dielectric Parameters for Head and Body Phantoms

The head tissue dielectric parameters recommended by the IEEE SCC-34/SC-2 in P1528 have been incorporated in the following table. These head parameters are derived from planar layer models simulating the highest expected SAR for the dielectric properties and tissue thickness variations in a human head. Other head and body tissue parameters that have not been specified in P1528 are derived from the tissue dielectric parameters computed from the 4-Cole-Cole equations described in Reference [12] and extrapolated according to the head parameters specified in P1528.

Robots

The DASY6 system uses the high-precision industrial robots TX60L, TX90XL, and RX160L from St aubli SA (France). The TX robot family - the successor of the well-known RX robot family - continues to offer the features important for DASY6 applications:

- High precision (repeatability 0.02mm)
- High reliability (industrial design)
- Low maintenance costs (virtually maintenance free due to direct drive gears; no belt drives)
- Jerk-free straight movements (brushless synchrony motors; no stepper motors)
- Low ELF interference (motor control fields shielded via the closed metallic construction shields)

The robots are controlled by the Staubli CS8c robot controllers. All information regarding the use and maintenance of the robot arm and the robot controller is provided

Area Scans

Area scans are defined prior to the measurement process being executed with a user defined variable spacing between each measurement point (integral) allowing low uncertainty measurements to be conducted. Scans defined for FCC applications utilize a 15mm 2 step integral, with 1.5mm interpolation used to locate the peak SAR area used for zoom scan assessments.

Where the system identifies multiple SAR peaks (which are within 25% of peak value) the system will provide the user with the option of assessing each peak location individually for zoom scan averaging.

Zoom Scan (Cube Scan Averaging)

The averaging zoom scan volume utilized in the DASY4 software is in the shape of a cube and the side dimension of a 1 g or 10 g mass is dependent on the density of the liquid representing the simulated tissue. A density of 1000 kg/m^3 is used to represent the head and body tissue density and not the phantom liquid density, in order to be consistent with the definition of the liquid dielectric properties, i.e. the side length of the 1g cube is 10mm,with the side length of the 10g cube is 21.5mm.

When the cube intersects with the surface of the phantom, it is oriented so that 3 vertices touch the surface of the shell or the center of a face is tangent to the surface. The face of the cube closest to the surface is modified in order to conform to the tangent surface.

The zoom scan integer steps can be user defined so as to reduce uncertainty, but normal practice for typical test applications (including FCC) utilize a physical step of 7 x7 x 7 (5mmx5mmx5mm) providing a volume of 30 mm in the X & Y & Z axis.

Recommended Tissue Dielectric Parameters for Head and Body

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

Tissue Dielectric Parameters for Head and Body Phantoms

The head tissue dielectric parameters recommended by the IEEE SCC-34/SC-2 in P1528 have been incorporated in the following table. These head parameters are derived from planar layer models simulating the highest expected SAR for the dielectric properties and tissue thickness variations in a human head. Other head and body tissue parameters that have not been specified in P1528 are derived from the tissue dielectric parameters computed from the 4-Cole-Cole equations described in Reference [12] and extrapolated according to the head parameters specified in P1528.

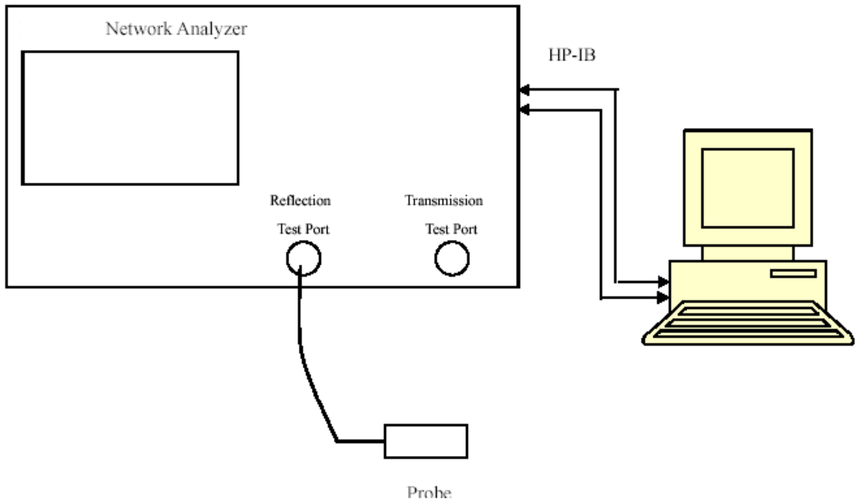
EQUIPMENT LIST AND CALIBRATION

Equipments List & Calibration Information

Equipment	Model	S/N	Calibration Date	Calibration Due Date
Robot	TX90	5N26A1	N.C.R	N.C.R
DASY5 Test Software	DASY5.2	N/A	N.C.R	N.C.R
DASY6 Measurement Server	DASY 6	1588	N/A	N/A
Data Acquisition Electronics	DAE4	1561	2018/11/7	2019/11/6
E-Field Probe	EX3DV4	7520	2018/11/15	2019/11/14
Dipole, 750 MHz	D750V3	1079	2018/10/26	2021/10/25
Dipole, 1800 MHz	D1800V2	2d207	2018/5/28	2021/5/27
Dipole,1900MHz	D1900V2	5d207	2018/5/28	2021/5/27
Dipole,2450MHz	D2450V2	969	2018/5/30	2021/5/29
Mounting Device	N/A	SD 000 H01 KA	N.C.R	N.C.R
Twin SAM	Twin SAM V5.0	1368	N.C.R	N.C.R
Twin SAM	Twin SAM V8.0	1953	N.C.R	N.C.R
Simulated Tissue 750 MHz Head	TS-750-H	750H	Each Time	/
Simulated Tissue 1750 MHz Head	TS-1750-H	1750H	Each Time	/
Simulated Tissue 1900 MHz Head	TS-1900-H	1900H	Each Time	/
Simulated Tissue 2450 MHz Head	TS-2450-H	2450H	Each Time	/
Simulated Tissue 1750 MHz Body	TS-1750-B	1750B	Each Time	/
Simulated Tissue 750 MHz Body	TS-750-B	750B	Each Time	/
Simulated Tissue 1900 MHz Body	TS-1900-B	1900B	Each Time	/
Simulated Tissue 2450 MHz Body	TS-2450-B	2450B	Each Time	/
Network Analyzer	8753D	3410A05361	2018/3/22	2019/3/21
Functional radio communication tester	CMW 290	101741	2018/8/17	2019/8/16
Signal Generator	8648C	3623A02870	2018/5/18	2019/5/17
Power Meter	E4418B	US39402167	2018/5/17	2019/5/16
Power Sensor	E9300A	US39210953	2018/5/17	2019/5/16
Power Amplifier	ZHL-42W+	329401642	2018/1/11	2019/1/10
Directional Coupler	488Z	000810	N.C.R	N.C.R
Attenuator	20dB, 100W	1453	N.C.R	N.C.R

SAR MEASUREMENT SYSTEM VERIFICATION

Liquid Verification



Liquid Verification Setup Block Diagram

Liquid Verification Results

Frequency (MHz)	Liquid Type	Liquid Parameter		Target Value		Delta (%)		Tolerance (%)
		Ơ (S/m)	εr	Ơ (S/m)	εr	Ơ (S/m)	Δεr	
1800.0	Body Tissue_1750 MHz	1.480	51.390	1.52	53.30	-2.63	-3.58	±5
1732.5	Body Tissue_1750 MHz	1.459	53.239	1.52	53.30	-4.01	-0.11	±5
1720.0	Body Tissue_1750 MHz	1.448	53.316	1.52	53.30	-4.74	0.03	±5
1745.0	Body Tissue_1750 MHz	1.474	53.161	1.52	53.30	-3.03	-0.26	±5
1900	Body Tissue_1900 MHz	1.552	55.297	1.52	53.30	2.11	3.75	±5
1880	Body Tissue_1900 MHz	1.531	55.368	1.52	53.30	0.72	3.88	±5
1860	Body Tissue_1900 MHz	1.510	55.449	1.51	55.45	1.39	-0.15	±5

**Liquid Verification above was performed on 2019-1-2*

Frequency (MHz)	Liquid Type	Liquid Parameter		Target Value		Delta (%)		Tolerance (%)
		Ơ (S/m)	εr	Ơ (S/m)	εr	Ơ (S/m)	Δεr	
2450	Body Tissue_2450 MHz	1.975	53.096	1.95	52.70	1.28	0.75	±5
2412	Body Tissue_2450 MHz	1.924	53.238	1.95	52.70	-1.33	1.02	±5
2437	Body Tissue_2450 MHz	1.958	53.141	1.95	52.70	0.41	0.84	±5
2462	Body Tissue_2450 MHz	1.991	53.042	1.95	52.70	2.10	0.65	±5

**Liquid Verification above was performed on 2019-1-2*

Frequency (MHz)	Liquid Type	Liquid Parameter		Target Value		Delta (%)		Tolerance (%)
		Ơ (S/m)	εr	Ơ (S/m)	εr	Ơ (S/m)	Δεr	
1800	Head Tissue_1750 MHz	1.412	40.336	1.40	40.00	0.86	0.84	±5
1720	Head Tissue_1750 MHz	1.35	40.218	1.36	40.15	-0.74	0.04	±5
1732.5	Head Tissue_1750 MHz	1.363	40.136	1.36	40.13	0.22	0.09	±5
1745	Head Tissue_1750 MHz	1.375	40.053	1.37	40.11	0.36	-0.12	±5
1900	Head Tissue_1900 MHz	1.453	41.350	1.40	40.00	3.79	3.38	±5
1860	Head Tissue_1900 MHz	1.412	41.513	1.40	40.00	0.86	3.78	±5
1880	Head Tissue_1900 MHz	1.432	41.428	1.40	40.00	2.29	3.57	±5
1900	Head Tissue_1900 MHz	1.453	41.35	1.40	40.00	3.79	3.38	±5
2450	Head Tissue_2450 MHz	1.880	37.970	1.80	39.20	4.44	-3.14	±5
2412	Head Tissue_2450 MHz	1.838	38.149	1.77	39.27	3.84	-2.93	±5
2437	Head Tissue_2450 MHz	1.863	38.021	1.79	39.22	4.08	-3.01	±5
2462	Head Tissue_2450 MHz	1.893	37.862	1.81	39.18	4.59	-3.41	±5

*Liquid Verification above was performed on **2019-1-3***

Frequency (MHz)	Liquid Type	Liquid Parameter		Target Value		Delta (%)		Tolerance (%)
		Ơ (S/m)	εr	Ơ (S/m)	εr	Ơ (S/m)	Δεr	
750.0	Body Tissue_750 MHz	0.963	55.933	0.96	55.50	0.31	0.78	±5
707.5	Body Tissue_750 MHz	0.923	56.354	0.96	55.50	-3.85	1.54	±5
704.0	Body Tissue_750 MHz	0.919	56.389	0.96	55.50	-3.85	1.54	±5
711	Body Tissue_750 MHz	0.926	56.320	0.96	55.50	-3.54	1.48	±5
750	Head Tissue_750 MHz	0.912	43.289	0.89	41.90	2.47	3.32	±5
704	Head Tissue_750 MHz	0.87	43.9	0.89	42.15	-2.25	4.03	±5
707.5	Head Tissue_750 MHz	0.873	43.851	0.89	42.13	-1.91	4.16	±5
711	Head Tissue_750 MHz	0.876	43.804	0.89	42.11	-1.57	4.05	±5

*Liquid Verification above was performed on **2019-1-15***

System Accuracy Verification

Prior to the assessment, the system validation kit was used to test whether the system was operating within its specifications of ±10%. The validation results are tabulated below. And also the corresponding SAR plot is attached as well in the SAR plots files.

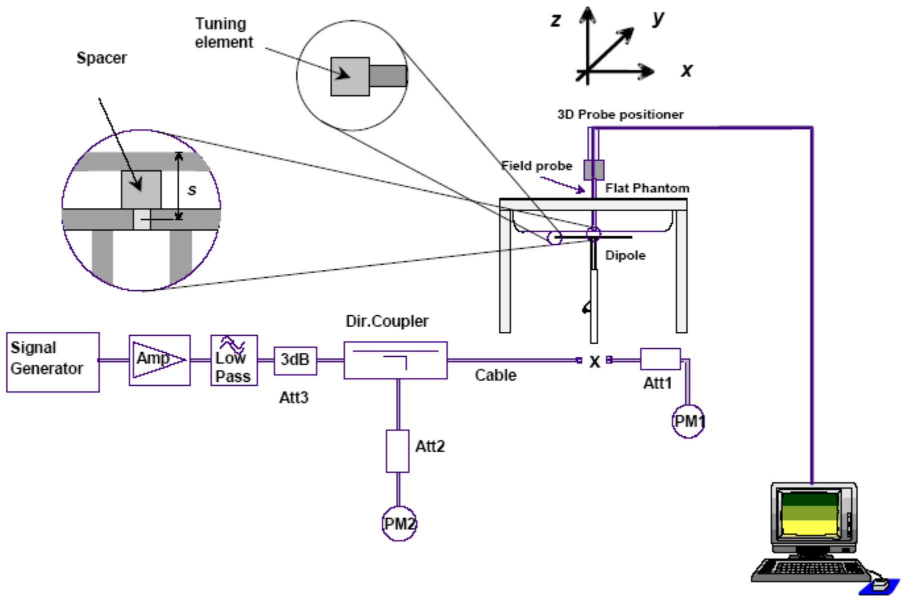
The spacing distances in the **System Verification Setup Block Diagram** is given by the following:

a) s = 15 mm ± 0,2 mm for 300 MHz ≤ f ≤ 1 000 MHz;

b) s = 10 mm ± 0,2 mm for 1 000 MHz < f ≤ 3 000 MHz;

c) s = 10 mm ± 0,2 mm for 3 000 MHz < f ≤ 6 000 MHz.

System Verification Setup Block Diagram



System Accuracy Check Results

Date	Frequency Band	Liquid Type	Input Power (mW)	Measured SAR (W/kg)		Normalized to 1W (W/kg)	Target Value(W/kg)	Delta (%)	Tolerance (%)
2019/1/15	750 MHz	Body	250	1g	2.31	9.24	8.72	5.96	±10
2019/1/2	1800 MHz	Body	250	1g	9.07	36.28	38.30	-5.27	±10
2019/1/2	1900 MHz	Body	250	1g	10.00	40.0	40.20	-0.50	±10
2019/1/2	2400 MHz	Body	250	1g	12.30	49.2	49.80	-1.20	±10
2019/1/15	750 MHz	Head	250	1g	2.18	8.72	8.46	3.07	±10
2019/1/3	1800 MHz	Head	250	1g	9.78	39.12	39.50	-0.96	±10
2019/1/3	1900 MHz	Head	250	1g	10.10	40.4	40.40	0.00	±10
2019/1/3	2400 MHz	Head	250	1g	13.10	52.4	52.60	-0.38	±10

*The SAR values above are normalized to 1 Watt forward power.

SAR SYSTEM VALIDATION DATA

System Check_Body_750MHz

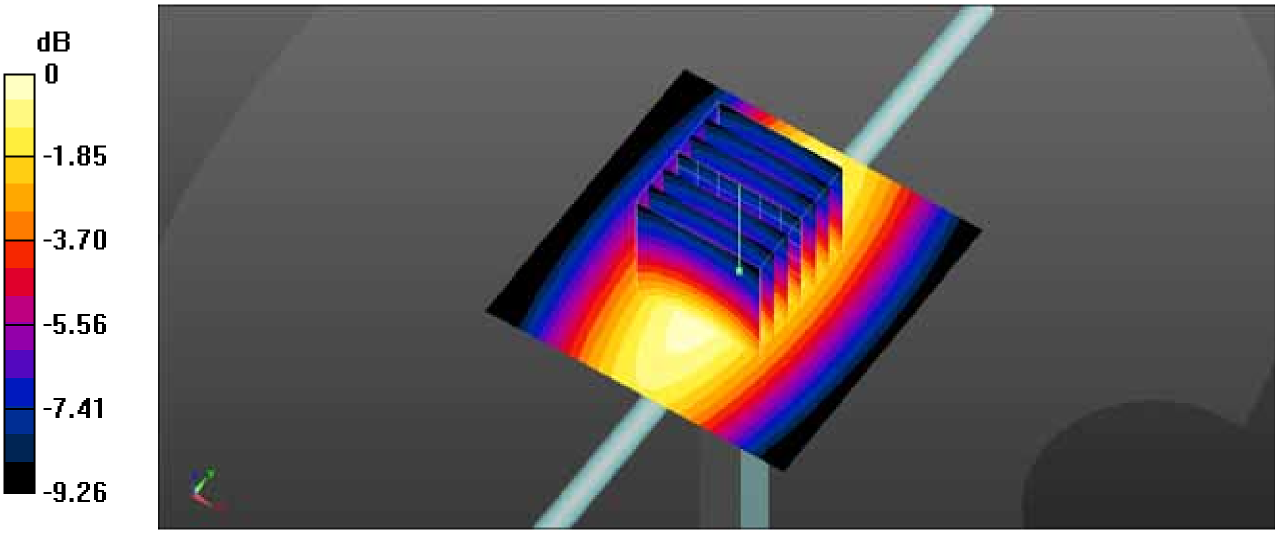
DUT: D750V3-1079

Communication System: CW; Frequency: 750 MHz;Duty Cycle: 1:1
Medium: MSL750 Medium parameters used: f = 750 MHz; σ = 0.963 S/m; ε_r = 55.933; ρ = 1000 kg/m^3

DASY5 Configuration:
- Probe: EX3DV4 - SN7520; ConvF(9.9, 9.9, 9.9); Calibrated: 11/5/2018
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1561; Calibrated: 11/7/2018
- Phantom: Twin-SAM V8.0 (20deg probe tilt)-Right; Type: QD 000 P40 CB; Serial: 1368
- Measurement SW: DASY52, Version 52.10 (1);SEMCAD X Version 14.6.11 (7437)

Pin=250mW/Area Scan (61x61x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 2.67 W/kg

Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 52.97 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 3.36 W/kg
SAR(1 g) = 2.31 W/kg; SAR(10 g) = 1.56 W/kg
Maximum value of SAR (measured) = 2.68 W/kg



0 dB = 2.68 W/kg = 4.28 dBW/kg

System Check_Body_1800MHz

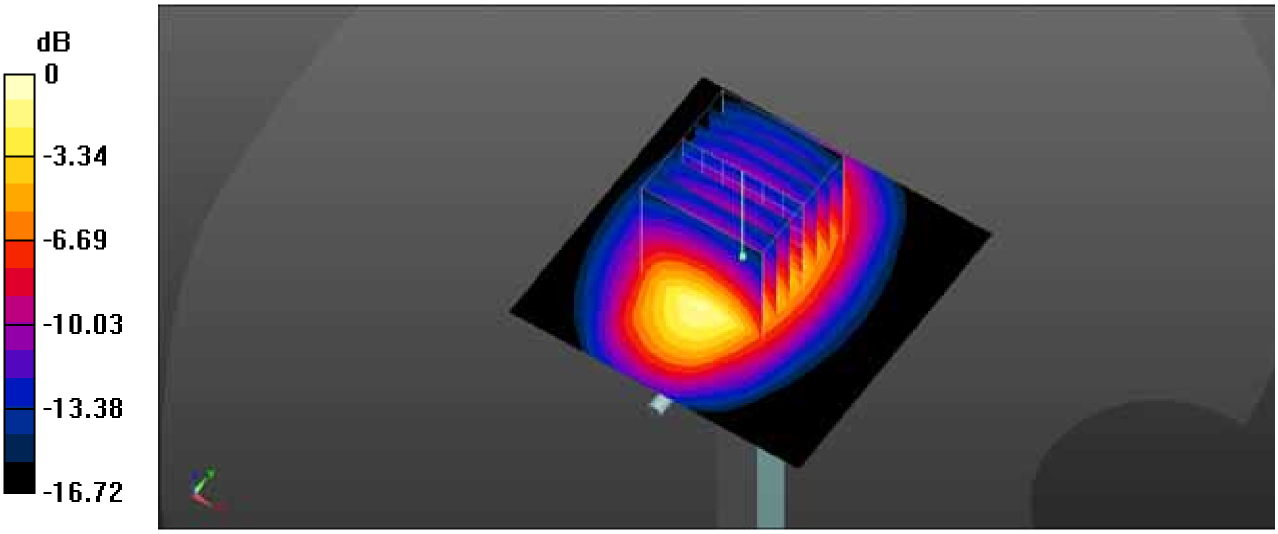
DUT: D1800V2-2d207

Communication System: CW; Frequency: 1800 MHz;Duty Cycle: 1:1
Medium: MSL1750 Medium parameters used: f = 1800 MHz; σ = 1.48 S/m; ε_r = 51.39; ρ = 1000 kg/m^3

DASY5 Configuration:
- Probe: EX3DV4 - SN7520; ConvF(8.11, 8.11, 8.11); Calibrated: 11/5/2018
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1561; Calibrated: 11/7/2018
- Phantom: Twin-SAM V8.0 (30deg probe tilt); Type: QD 000 P41 Ax; Serial: 1953
- Measurement SW: DASY52, Version 52.10 (1);SEMCAD X Version 14.6.11 (7437)

Pin=250mW/Area Scan (61x61x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 11.7 W/kg

Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 85.59 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 16.4 W/kg
SAR(1 g) = 9.07 W/kg; SAR(10 g) = 4.79 W/kg
Maximum value of SAR (measured) = 11.4 W/kg



0 dB = 11.4 W/kg = 10.57 dBW/kg

System Check_Body_1900MHz

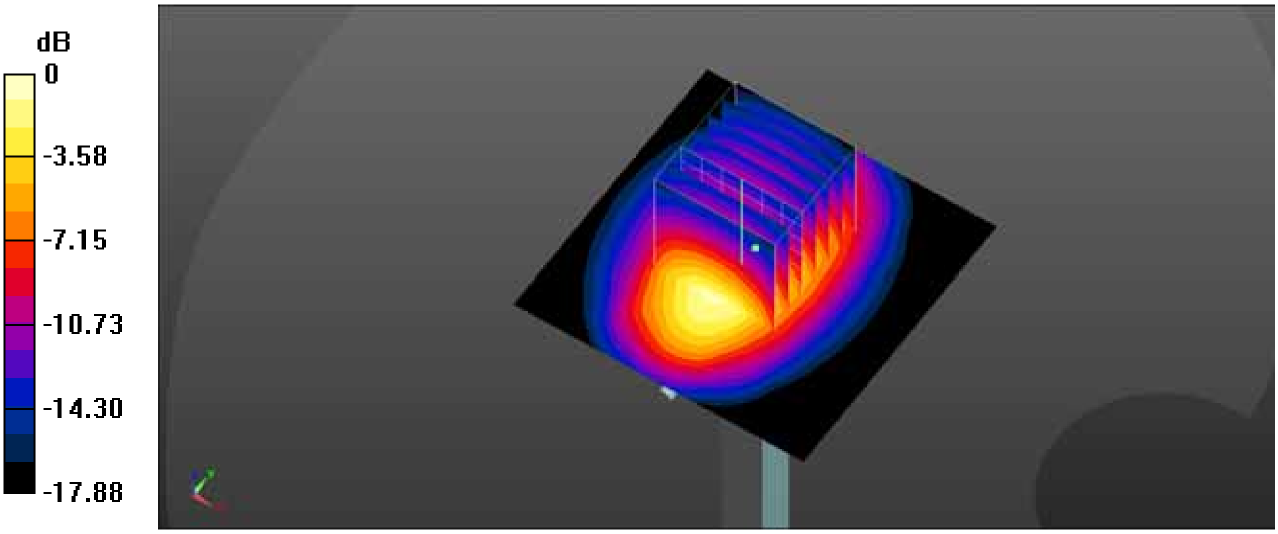
DUT: D1900V2-5d207

Communication System: CW; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium: MSL1900 Medium parameters used: f = 1900 MHz; σ = 1.552 S/m; ε_r = 55.297; ρ = 1000 kg/m^3

DASY5 Configuration:
- Probe: EX3DV4 - SN7520; ConvF(7.84, 7.84, 7.84); Calibrated: 11/5/2018
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1561; Calibrated: 11/7/2018
- Phantom: Twin-SAM V8.0 (30deg probe tilt); Type: QD 000 P41 Ax; Serial: 1953
- Measurement SW: DASY52, Version 52.10 (1);SEMCAD X Version 14.6.11 (7437)

Pin=250mW/Area Scan (61x61x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 13.0 W/kg

Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 89.25 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 18.5 W/kg
SAR(1 g) = 10 W/kg; SAR(10 g) = 5.16 W/kg
Maximum value of SAR (measured) = 12.8 W/kg



0 dB = 12.8 W/kg = 11.07 dBW/kg

System Check_Body_2450MHz

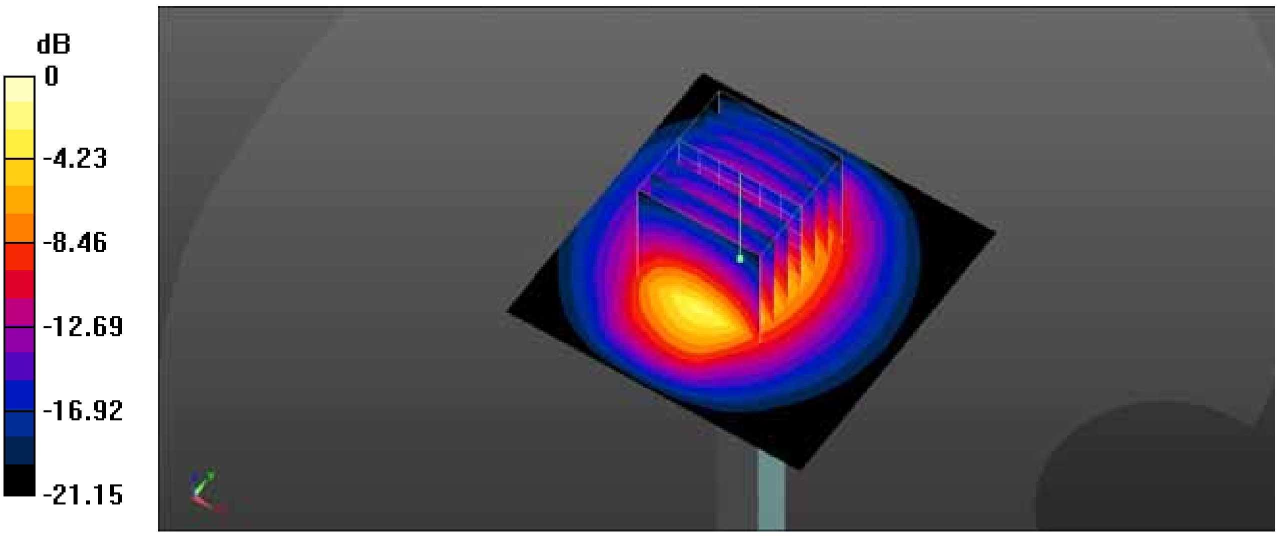
DUT: D2450V2-969

Communication System: CW; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium: MSL2450 Medium parameters used (interpolated): f = 2450 MHz; σ = 1.975 S/m; ε_r = 53.096; ρ = 1000 kg/m^3

DASY5 Configuration:
- Probe: EX3DV4 - SN7520; ConvF(7.48, 7.48, 7.48); Calibrated: 11/5/2018
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1561; Calibrated: 11/7/2018
- Phantom: Twin-SAM V8.0 (30deg probe tilt); Type: QD 000 P41 Ax; Serial: 1953
- Measurement SW: DASY52, Version 52.10 (1);SEMCAD X Version 14.6.11 (7437)

Pin=250mW/Area Scan (61x61x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 16.4 W/kg

Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 86.35 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 25.1 W/kg
SAR(1 g) = 12.3 W/kg; SAR(10 g) = 5.75 W/kg
Maximum value of SAR (measured) = 16.3 W/kg



0 dB = 16.3 W/kg = 12.12 dBW/kg

System Check_Head_750MHz

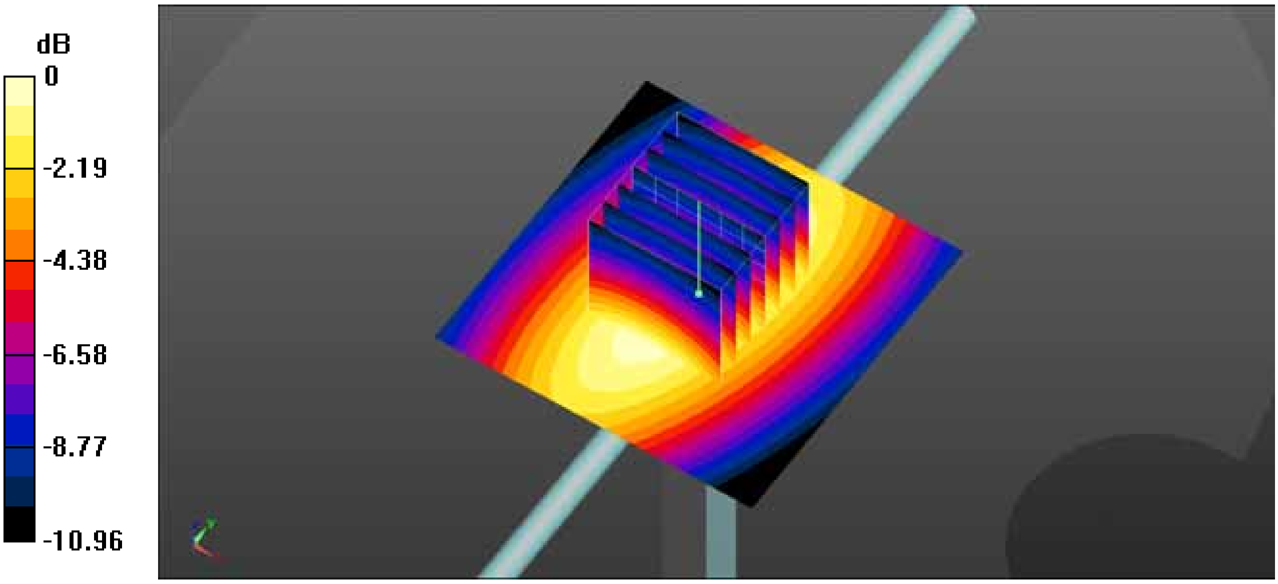
DUT: D750V3-1079

Communication System: CW; Frequency: 750 MHz;Duty Cycle: 1:1
Medium: HSL750 Medium parameters used: f = 750 MHz; σ = 0.912 S/m; ε_r = 43.289; ρ = 1000 kg/m^3

DASY5 Configuration:
- Probe: EX3DV4 - SN7520; ConvF(9.96, 9.96, 9.96); Calibrated: 11/5/2018
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1561; Calibrated: 11/7/2018
- Phantom: Twin-SAM V8.0 (20deg probe tilt)-Right; Type: QD 000 P40 CB; Serial: 1368
- Measurement SW: DASY52, Version 52.10 (1);SEMCAD X Version 14.6.11 (7437)

Pin=250mW/Area Scan (61x61x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 2.57 W/kg

Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 53.71 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 3.29 W/kg
SAR(1 g) = 2.18 W/kg; SAR(10 g) = 1.41 W/kg
Maximum value of SAR (measured) = 2.56 W/kg



0 dB = 2.56 W/kg = 4.08 dBW/kg

System Check_Head_1800MHz

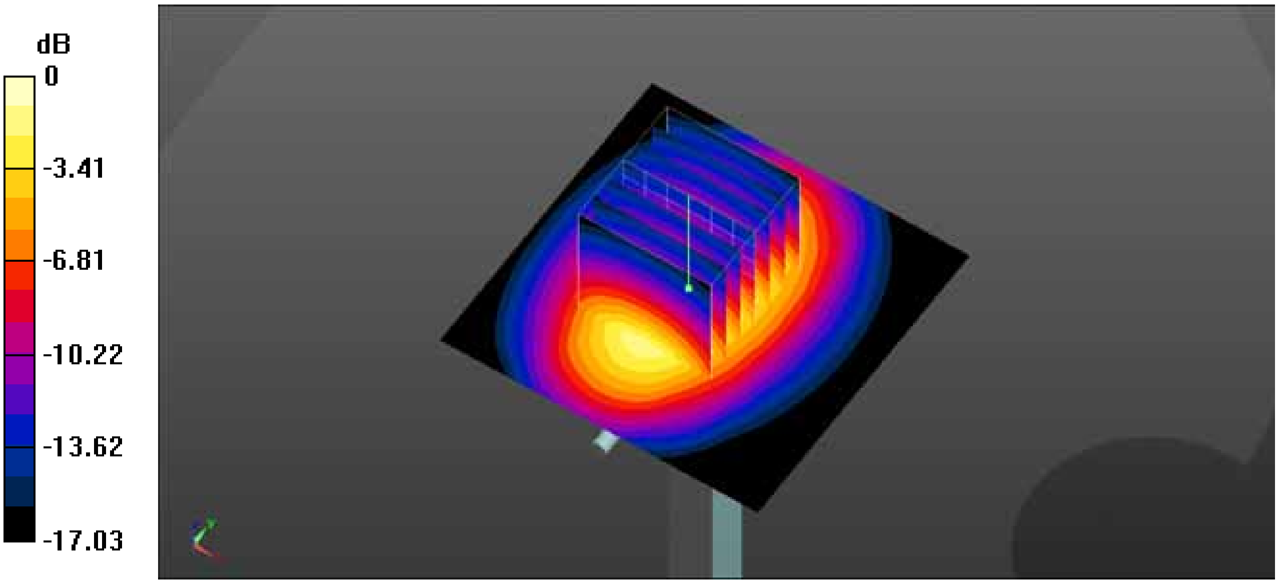
DUT: D1800V2-2d207

Communication System: CW; Frequency: 1800 MHz;Duty Cycle: 1:1
Medium: HSL1750 Medium parameters used: f = 1800 MHz; σ = 1.412 S/m; ε_r = 40.336; ρ = 1000 kg/m^3

DASY5 Configuration:
- Probe: EX3DV4 - SN7520; ConvF(8.57, 8.57, 8.57); Calibrated: 11/5/2018
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1561; Calibrated: 11/7/2018
- Phantom: Twin-SAM V8.0 (30deg probe tilt); Type: QD 000 P41 Ax; Serial: 1953
- Measurement SW: DASY52, Version 52.10 (1);SEMCAD X Version 14.6.11 (7437)

Pin=250mW/Area Scan (61x61x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 12.5 W/kg

Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 92.08 V/m; Power Drift = -0.00 dB
Peak SAR (extrapolated) = 18.2 W/kg
SAR(1 g) = 9.78 W/kg; SAR(10 g) = 5.14 W/kg
Maximum value of SAR (measured) = 12.4 W/kg



0 dB = 12.4 W/kg = 10.93 dBW/kg

System Check_Head_1900MHz

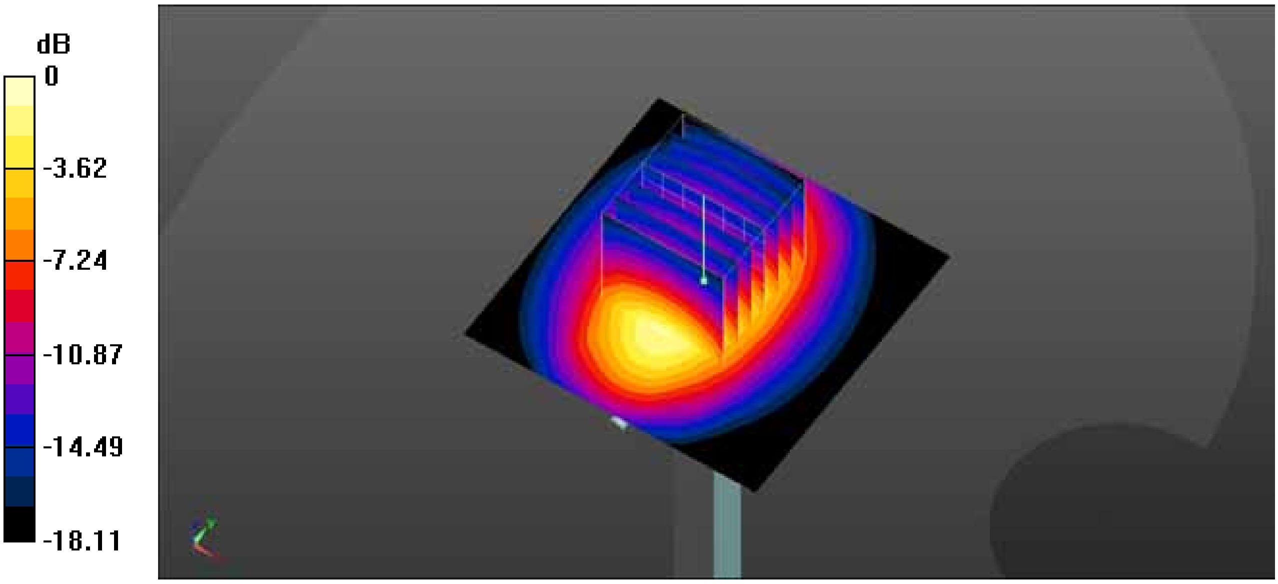
DUT: D1900V2-5d207

Communication System: CW; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium: HSL1900 Medium parameters used: f = 1900 MHz; σ = 1.453 S/m; ε_r = 41.35; ρ = 1000 kg/m^3

DASY5 Configuration:
- Probe: EX3DV4 - SN7520; ConvF(8.26, 8.26, 8.26); Calibrated: 11/5/2018
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1561; Calibrated: 11/7/2018
- Phantom: Twin-SAM V8.0 (30deg probe tilt); Type: QD 000 P41 Ax; Serial: 1953
- Measurement SW: DASY52, Version 52.10 (1);SEMCAD X Version 14.6.11 (7437)

Pin=250mW/Area Scan (61x61x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 13.1 W/kg

Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 93.47 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 19.2 W/kg
SAR(1 g) = 10.1 W/kg; SAR(10 g) = 5.23 W/kg
Maximum value of SAR (measured) = 12.9 W/kg



0 dB = 12.9 W/kg = 11.11 dBW/kg

System Check_Head_2450MHz

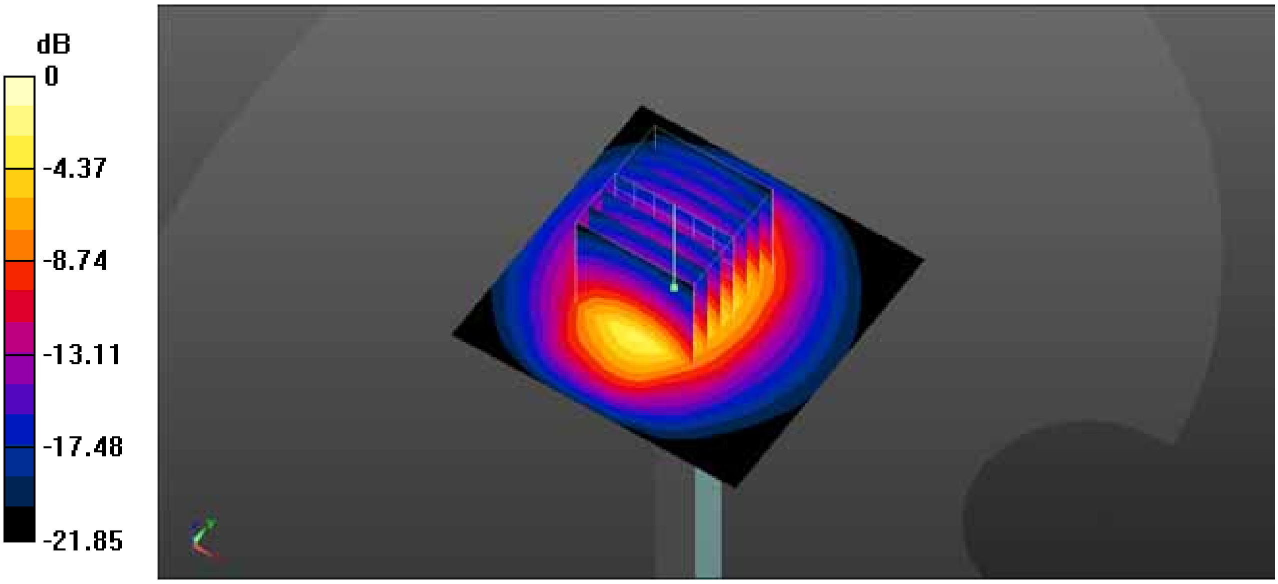
DUT: D2450V2-969

Communication System: CW ; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium: HSL2450 Medium parameters used: f = 2450 MHz; $\sigma = 1.88$ S/m; $\varepsilon_r = 37.97$; $\rho = 1000$ kg/m^3

DASY5 Configuration:
- Probe: EX3DV4 - SN7520; ConvF(7.33, 7.33, 7.33); Calibrated: 11/5/2018
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1561; Calibrated: 11/7/2018
- Phantom: Twin-SAM V8.0 (30deg probe tilt); Type: QD 000 P41 Ax; Serial: 1953
- Measurement SW: DASY52, Version 52.10 (1);SEMCAD X Version 14.6.11 (7437)

Pin=250mW/Area Scan (61x61x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 17.7 W/kg

Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 93.38 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 27.3 W/kg
SAR(1 g) = 13.1 W/kg; SAR(10 g) = 6.11 W/kg
Maximum value of SAR (measured) = 17.4 W/kg



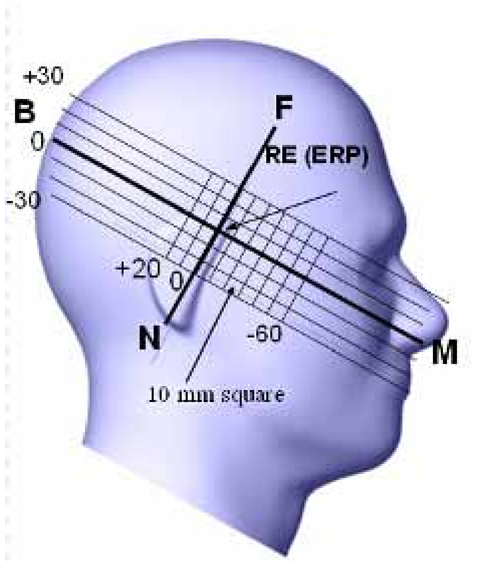
0 dB = 17.4 W/kg = 12.41 dBW/kg

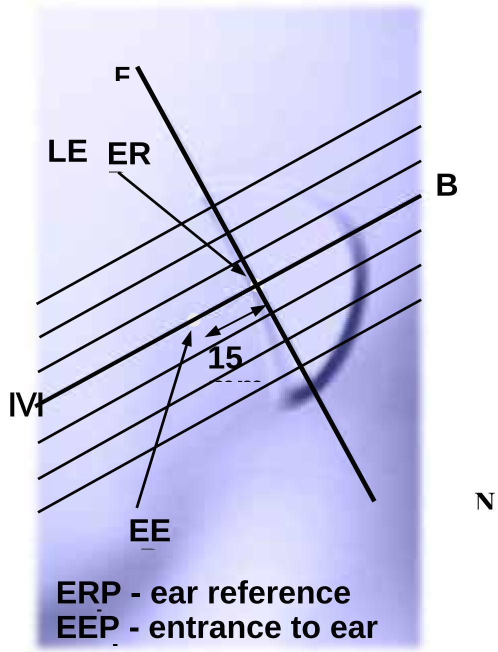
EUT TEST STRATEGY AND METHODOLOGY

Test Positions for Device Operating Next to a Person's Ear

This category includes most wireless handsets with fixed, retractable or internal antennas located toward the top half of the device, with or without a foldout, sliding or similar keypad cover. The handset should have its earpiece located within the upper ¼ of the device, either along the centerline or off-centered, as perceived by its users. This type of handset should be positioned in a normal operating position with the "test device reference point" located along the "vertical centerline" on the front of the device aligned to the "ear reference point". The "test device reference point" should be located at the same level as the center of the earpiece region. The "vertical centerline" should bisect the front surface of the handset at its top and bottom edges. A "ear reference point" is located on the outer surface of the head phantom on each ear spacer. It is located 1.5 cm above the center of the ear canal entrance in the "phantom reference plane" defined by the three lines joining the center of each "ear reference point" (left and right) and the tip of the mouth.

A handset should be initially positioned with the earpiece region pressed against the ear spacer of a head phantom. For the SCC-34/SC-2 head phantom, the device should be positioned parallel to the "N-F" line defined along the base of the ear spacer that contains the "ear reference point". For interim head phantoms, the device should be positioned parallel to the cheek for maximum RF energy coupling. The "test device reference point" is aligned to the "ear reference point" on the head phantom and the "vertical centerline" is aligned to the "phantom reference plane". This is called the "initial ear position". While maintaining these three alignments, the body of the handset is gradually adjusted to each of the following positions for evaluating SAR:





Cheek/Touch Position

The device is brought toward the mouth of the head phantom by pivoting against the "ear reference point" or along the "N-F" line for the SCC-34/SC-2 head phantom.

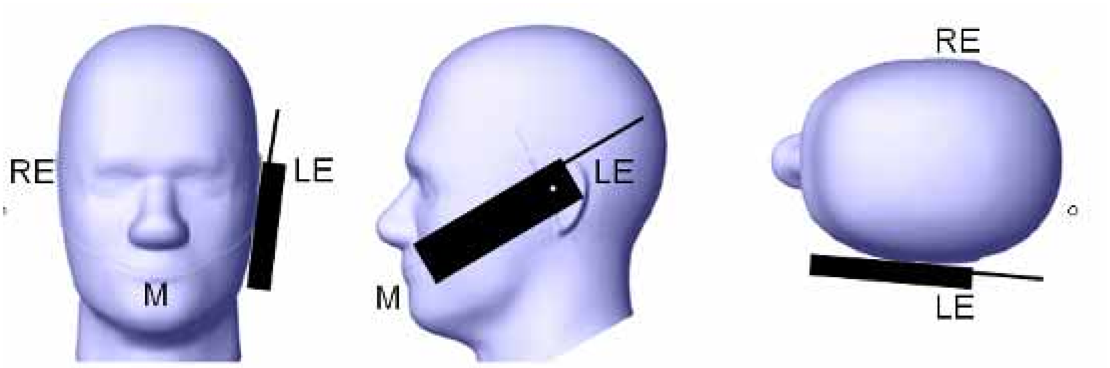
This test position is established:

When any point on the display, keypad or mouthpiece portions of the handset is in contact with the phantom.

(or) When any portion of a foldout, sliding or similar keypad cover opened to its intended self-adjusting normal use position is in contact with the cheek or mouth of the phantom.

For existing head phantoms – when the handset loses contact with the phantom at the pivoting point, rotation should continue until the device touches the cheek of the phantom or breaks its last contact from the ear spacer.

Cheek /Touch Position



Ear/Tilt Position

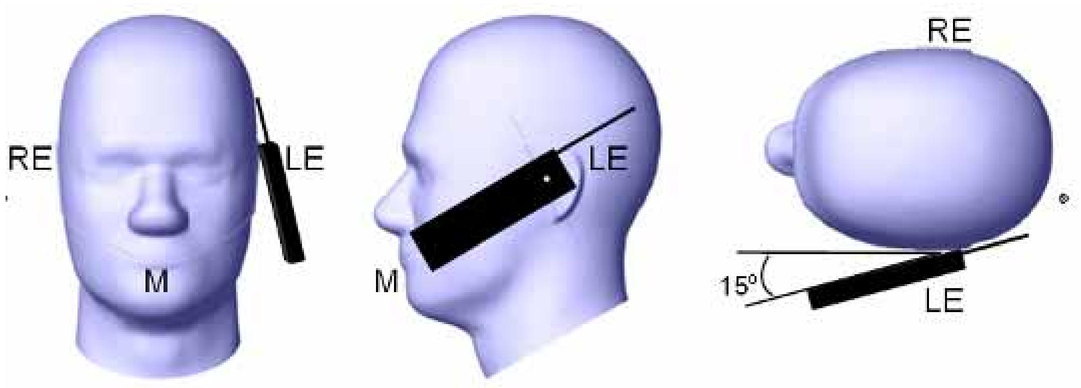
With the handset aligned in the "Cheek/Touch Position":

1) If the earpiece of the handset is not in full contact with the phantom's ear spacer (in the "Cheek/Touch position") and the peak SAR location for the "Cheek/Touch" position is located at the ear spacer region or corresponds to the earpiece region of the handset, the device should be returned to the "initial ear position" by rotating it away from the mouth until the earpiece is in full contact with the ear spacer.

2) (otherwise) The handset should be moved (translated) away from the cheek perpendicular to the line passes through both "ear reference points" (note: one of these ear reference points may not physically exist on a split head model) for approximate 2-3 cm. While it is in this position, the device handset is tilted away from the mouth with respect to the "test device reference point" until the inside angle between the vertical centerline on the front surface of the phone and the horizontal line passing through the ear reference point is by 15 80°. After the tilt, it is then moved (translated) back toward the head perpendicular to the line passes through both "ear reference points" until the device touches the phantom or the ear spacer. If the antenna touches the head first, the positioning process should be repeated with a tilt angle less than 15° so that the device and its antenna would touch the phantom simultaneously. This test position may require a device holder or positioner to achieve the translation and tilting with acceptable positioning repeatability.

If a device is also designed to transmit with its keypad cover closed for operating in the head position, such positions should also be considered in the SAR evaluation. The device should be tested on the left and right side of the head phantom in the "Cheek/Touch" and "Ear/Tilt" positions. When applicable, each configuration should be tested with the antenna in its fully extended and fully retracted positions. These test configurations should be tested at the high, middle and low frequency channels of each operating mode; for example, AMPS, CDMA, and TDMA. If the SAR measured at the middle channel for each test configuration (left, right, Cheek/Touch, Tilt/Ear, extended and retracted) is at least 2.0 dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s). If the transmission band of the test device is less than 10 MHz, testing at the high and low frequency channels is optional.

Ear /Tilt 15º Position



Test positions for body-worn and other configurations

Body-worn operating configurations should be tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in normal use configurations. Devices with a headset output should be tested with a headset connected to the device. When multiple accessories that do not contain metallic components are supplied with the device, the device may be tested with only the accessory that dictates the closest spacing to the body. When multiple accessories that contain metallic components are supplied with the device, the device must be tested with each accessory that contains a unique metallic component. If multiple accessories share an identical metallic component (e.g., the same metallic belt-clip used with different holsters with no other metallic components), only the accessory that dictates the closest spacing to the body must be tested.

Body-worn accessories may not always be supplied or available as options for some devices that are intended to be authorized for body-worn use. A separation distance of 1.5 cm between the back of the device and a flat phantom is recommended for testing body-worn SAR compliance under such circumstances. Other separation distances may be used, but they should not exceed 2.5 cm. In these cases, the device may use body-worn accessories that provide a separation distance greater than that tested for the device provided however that the accessory contains no metallic components.

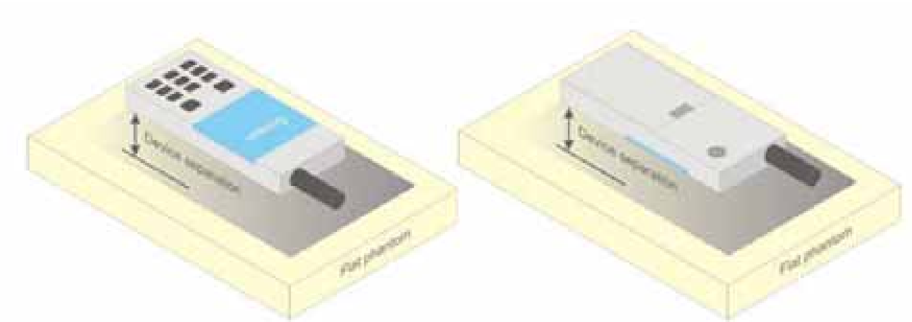


Figure 5 – Test positions for body-worn devices

Test Distance for SAR Evaluation

For this case the EUT(Equipment Under Test) is set 10mm away from the phantom, the test distance is 10mm.

SAR Evaluation Procedure

The evaluation was performed with the following procedure:

Step 1: Measurement of the SAR value at a fixed location above the ear point or central position was used as a reference value for assessing the power drop. The SAR at this point is measured at the start of the test and then again at the end of the testing.

Step 2: The SAR distribution at the exposed side of the head was measured at a distance of 4 mm from the inner surface of the shell. The area covered the entire dimension of the head or radiating structures of the EUT, the horizontal grid spacing was 15 mm x 15 mm, and the SAR distribution was determined by integrated grid of 1.5mm x 1.5mm. Based on these data, the area of the maximum absorption was determined by spline interpolation. The first Area Scan covers the entire dimension of the EUT to ensure that the hotspot was correctly identified.

Step 3: Around this point, a volume of 30 mm x 30 mm x 30 mm was assessed by measuring 7x 7 x 7 points. On the basis of this data set, the spatial peak SAR value was evaluated under the following procedure:

1) The data at the surface were extrapolated, since the center of the dipoles is 1.2 mm away from the tip of the probe and the distance between the surface and the lowest measuring point is 1.3 mm. The extrapolation was based on a least square algorithm. A polynomial of the fourth order was calculated through the points in z-axes. This polynomial was then used to evaluate the points between the surface and the probe tip.

2) The maximum interpolated value was searched with a straightforward algorithm. Around this maximum the SAR values averaged over the spatial volumes (1 g or 10 g) were computed by the 3D-Spline interpolation algorithm. The 3D-Spline is composed of three one dimensional splines with the “Not a knot"-condition (in x, y and z-directions). The volume was integrated with the trapezoidal-algorithm. One thousand points (10 x 10 x 10) were interpolated to calculate the averages.

All neighboring volumes were evaluated until no neighboring volume with a higher average value was found.

Step 4: Re-measurement of the SAR value at the same location as in Step 1. If the value changed by more than 5%, the evaluation was repeated.

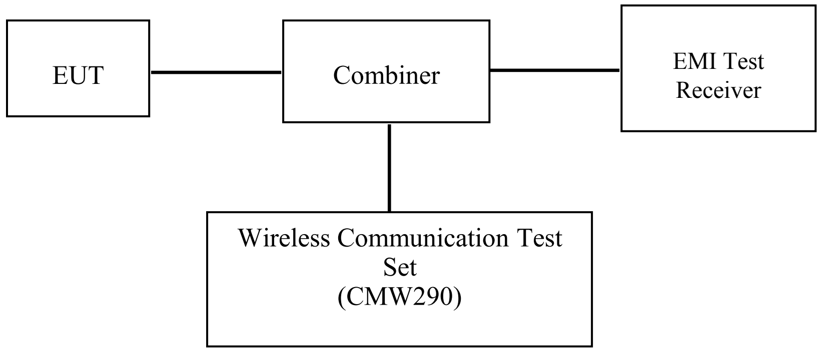
CONDUCTED OUTPUT POWER MEASUREMENT

Provision Applicable

The measured peak output power should be greater and within 5% than EMI measurement.

Test Procedure

The RF output of the transmitter was connected to the input of the EMI Test Receiver through sufficient attenuation.



LTE

Radio Configuration

The power measurement was configured by the Wireless Communication Test Set.

LTE Cat M

escription of Test Configuration

The EUT was configured for testing according to TIA/EIA-603-E.
The final qualification test was performed with the EUT operating at normal mode.
eMTC Auto Mode: Narrowband and resource blocks per cell BW

Test Item	LTE Band	Bandwidth(MHz)						Modulation		RB setting	TBS	Test
		1.4	3	5	10	15	20	QPSK	16QAM	NB	Idx	channel
RF Output Power**	2	✓	✓	✓	✓	✓	✓	✓	✓	0	10	L/M/H
	4	✓	✓	✓	✓	✓	✓	✓	✓	0	10	L/M/H
	12	✓	✓	✓	✓	×	×	✓	✓	0	10	L/M/H

LTE

For UE Power Class 1 and 3, the allowed Maximum Power Reduction (MPR) for the maximum output power in Table 6.2.2-1due to higher order modulation and transmit bandwidth configuration (resource blocks) is specified in Table 6.2.3-1.

Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 1 and 3

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

For UE Power Class 1 and 3 the specific requirements and identified subclauses are specified in Table 6.2.4-1 along with the allowed A-MPR values that may be used to meet these requirements. The allowed A-MPR values specified below in Table 6.2.4.-1 to 6.2.4-15 are in addition to the allowed MPR requirements specified in sub-clause 6.2.3.

Table 6.2.4-1: Additional Maximum Power Reduction (A-MPR)

Network Signalling value	Requirements (subclause)	E-UTRA Band	Channel bandwidth (MHz)	Resources Blocks (N_{RB})	A-MPR (dB)
NS_01	6.6.2.1.1	Table 5.5-1	1.4, 3, 5, 10, 15, 20	Table 5.6-1	N/A
NS_03	6.6.2.2.1	2, 4,10, 23, 25, 35, 36	3	>5	≤ 1
			5	>6	≤ 1
			10	>6	≤ 1
			15	>8	≤ 1
			20	>10	≤ 1
NS_04	6.6.2.2.2	41	5	>6	≤ 1
			10, 15, 20	Table 6.2.4-4	
NS_05	6.6.3.3.1	1	10,15,20	≥ 50	≤ 1
NS_06	6.6.2.2.3	12, 13, 14, 17	1.4, 3, 5, 10	Table 5.6-1	N/A
NS_07	6.6.2.2.3 6.6.3.3.2	13	10	Table 6.2.4-2	
NS_08	6.6.3.3.3	19	10, 15	> 44	≤ 3
NS_09	6.6.3.3.4	21	10, 15	> 40	≤ 1
				> 55	≤ 2
NS_10		20	15, 20	Table 6.2.4-3	
NS_11	6.6.2.2.1	23	1.4, 3, 5, 10, 15, 20	Table 6.2.4-5	
NS_12	6.6.3.3.5	26	1.4, 3, 5	Table 6.2.4-6	
NS_13	6.6.3.3.6	26	5	Table 6.2.4-7	
NS_14	6.6.3.3.7	26	10, 15	Table 6.2.4-8	
NS_15	6.6.3.3.8	26	1.4, 3, 5, 10, 15	Table 6.2.4-9 Table 6.2.4-10	
NS_16	6.6.3.3.9	27	3, 5, 10	Table 6.2.4-11, Table 6.2.4-12, Table 6.2.4-13	
NS_17	6.6.3.3.10	28	5, 10	Table 5.6-1	N/A
NS_18	6.6.3.3.11	28	5	≥ 2	≤ 1
			10, 15, 20	≥ 1	≤ 4
NS_19	6.6.3.3.12	44	10, 15, 20	Table 6.2.4-14	
NS_20	6.2.2 6.6.2.2.1 6.6.3.2	23	5, 10, 15, 20	Table 6.2.4-15	
…					
NS_32	-	-	-	-	-

Maximum Target Output Power

Max Target Power(dBm)			
Mode/Band	Channel		
	Low	Middle	High
LTE Band 12	24.0	24.0	24.0
LTE Band 4	24.0	24.0	24.0
LTE Band 2	24.0	24.0	24.0
WLAN(802.11b)	13.0	13.0	13.0
WLAN(802.11g)	11.5	11.5	11.5
WLAN(802.11n HT20)	11.5	11.5	11.5
WLAN(802.11n HT40)	11.5	11.5	12.0

LTE Band 2:

Test Bandwidth	Test Modulation	Resource Block & RB offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)
20M	QPSK	1#0	23.35	**23.4**	23.19
		1#2	23.3	23.35	23.12
		1#5	23.3	23.33	23.11
		3#0	23.32	23.36	23.18
		3#1	23.1	23.18	23.18
		3#2	23.25	23.31	23.1
		6#0	23.33	23.36	23.16
	16-QAM	1#0	23.32	23.38	23.13
		1#2	23.23	23.3	23.03
		1#5	23.3	23.31	23.01
		3#0	23.01	23.17	23.14
		3#1	23.28	23.31	23.17
		3#2	23.24	23.21	23.07
		5#0	23.18	23.26	23.07
15M	QPSK	1#0	23.35	23.36	23.09
		1#2	23.2	23.27	23.02
		1#5	23.21	23.23	23.09
		3#0	23.06	23.11	23.13
		3#1	23.23	23.3	23.08
		3#2	23.24	23.28	23.05
		6#0	23.3	23.28	23.07
	16-QAM	1#0	23.24	23.28	23.08
		1#2	23.14	23.27	23.03
		1#5	23.29	23.21	22.97
		3#0	22.99	23.15	23.1
		3#1	23.19	23.23	23.16
		3#2	23.21	23.14	23.07
		5#0	23.11	23.19	22.99

10M	QPSK	1#0	23.25	23.34	23.02
		1#2	23.12	23.21	23.01
		1#5	23.12	23.22	23.08
		3#0	23.04	23.08	23.03
		3#1	23.2	23.23	23.08
		3#2	23.17	23.26	23.05
		6#0	23.2	23.22	23.07
	16-QAM	1#0	23.14	23.24	23.07
		1#2	23.06	23.22	22.99
		1#5	23.25	23.14	22.9
		3#0	22.99	23.12	23.07
		3#1	23.17	23.15	23.09
		3#2	23.18	23.05	22.98
		5#0	23.07	23.18	22.95
5M	QPSK	1#0	23.19	23.31	23
		1#2	23.03	23.11	22.95
		1#5	23.09	23.19	23.07
		3#0	22.96	23.02	23.02
		3#1	23.17	23.19	22.98
		3#2	23.17	23.21	22.98
		6#0	23.17	23.14	23.07
	16-QAM	1#0	23.06	23.2	23.07
		1#2	22.97	23.12	22.98
		1#5	23.21	23.05	22.81
		3#0	22.91	23.06	22.99
		3#1	23.16	23.06	23.09
		3#2	23.18	22.95	22.98
		5#0	23.06	23.17	22.89

3M	QPSK	1#0	23.19	23.23	23
		1#2	22.95	23.07	22.85
		1#5	23.07	23.13	23.05
		3#0	22.91	22.94	22.95
		3#1	23.08	23.19	22.96
		3#2	23.16	23.13	22.98
		6#0	23.1	23.06	23.05
	16-QAM	1#0	23.04	23.18	22.99
		1#2	22.97	23.06	22.91
		1#5	23.15	23.03	22.77
		3#0	22.89	22.98	22.91
		3#1	23.14	22.97	22.99
		3#2	23.1	22.88	22.9
		5#0	23.02	23.15	22.84
1.4M	QPSK	1#0	23.1	23.28	22.93
		1#2	22.95	23.08	22.93
		1#5	22.99	23.11	23.00
		3#0	22.87	22.97	22.99
		3#1	23.16	23.11	22.98
		3#2	23.16	23.16	22.95
		6#0	23.17	23.13	23.03
	16-QAM	1#0	22.96	23.17	23.02
		1#2	22.9	23.06	22.98
		1#5	23.12	22.98	22.74
		3#0	22.87	23.02	22.91
		3#1	23.06	23.03	23.07
		3#2	23.09	22.88	22.95
		5#0	23	23.12	22.8

LTE Band 4:

Test Bandwidth	Test Modulation	Resource Block & RB offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)
20M	QPSK	1#0	23.35	**23.4**	23.11
		1#2	23.26	23.3	23.19
		1#5	23.27	23.35	23.1
		3#0	23.09	23.33	23.08
		3#1	23.04	23.14	23.08
		3#2	23.23	23.31	23.09
		6#0	23.04	23.13	23.18
	16-QAM	1#0	23.33	23.36	23.05
		1#2	23.24	23.24	23.13
		1#5	23.17	23.34	23.07
		3#0	23.02	23.01	23.03
		3#1	23.02	23.05	23.02
		3#2	23.19	23.25	23.03
		5#0	22.98	23.07	23.16
15M	QPSK	1#0	23.31	23.36	23.04
		1#2	23.19	23.22	23.1
		1#5	23.27	23.28	23.1
		3#0	23.09	22.99	23.03
		3#1	22.95	23.1	23.03
		3#2	23.17	23.26	23.07
		6#0	23	23.12	23.1
	16-QAM	1#0	23.32	23.29	23.02
		1#2	23.24	23.22	23.05
		1#5	23.15	23.28	23.05
		3#0	22.96	22.95	23
		3#1	22.99	22.95	22.93
		3#2	23.1	23.22	23
		5#0	22.91	22.97	23.09

10M	QPSK	1#0	23.29	23.35	23
		1#2	23.09	23.19	23.09
		1#5	23.24	23.21	23.01
		3#0	23.06	22.93	22.97
		3#1	22.9	23.1	23
		3#2	23.14	23.26	23.06
		6#0	22.97	23.06	23.1
	16-QAM	1#0	23.31	23.24	22.95
		1#2	23.23	23.22	22.97
		1#5	23.14	23.2	23.01
		3#0	22.87	22.9	22.91
		3#1	22.98	22.93	22.87
		3#2	23.06	23.22	23
		5#0	22.84	22.89	23.06
5M	QPSK	1#0	23.19	23.27	22.97
		1#2	23.09	23.09	23.03
		1#5	23.16	23.18	22.91
		3#0	22.97	22.87	22.92
		3#1	22.89	23.06	22.97
		3#2	23.06	23.16	23.01
		6#0	22.91	23.06	23.06
	16-QAM	1#0	23.25	23.21	22.9
		1#2	23.21	23.17	22.97
		1#5	23.06	23.16	22.97
		3#0	22.8	22.84	22.84
		3#1	22.94	22.87	22.84
		3#2	22.96	23.13	22.95
		5#0	22.79	22.87	22.98

3M	QPSK	1#0	23.1	23.19	22.88
		1#2	23.06	23.05	22.98
		1#5	23.14	23.15	22.82
		3#0	22.94	22.85	22.87
		3#1	22.89	23	22.88
		3#2	22.96	23.14	22.98
		6#0	22.83	23.05	23.05
	16-QAM	1#0	23.23	23.16	22.86
		1#2	23.13	23.14	22.92
		1#5	23.02	23.12	22.92
		3#0	22.74	22.8	22.8
		3#1	22.93	22.83	22.8
		3#2	22.96	23.1	22.93
		5#0	22.77	22.82	22.95
1.4M	QPSK	1#0	23.04	23.09	22.82
		1#2	23.02	22.98	22.89
		1#5	23.14	23.12	22.8
		3#0	22.89	22.78	22.87
		3#1	22.85	22.92	22.82
		3#2	22.88	23.14	22.92
		6#0	22.73	23.05	22.99
	16-QAM	1#0	23.19	23.06	22.76
		1#2	23.07	23.1	22.88
		1#5	23.02	23.09	22.83
		3#0	22.64	22.74	22.79
		3#1	22.83	22.79	22.73
		3#2	22.91	23.02	22.93
		5#0	22.74	22.72	22.91

LTE Band 12:

Test Bandwidth	Test Modulation	Resource Block & RB offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)
10M	QPSK	1#0	23.33	**23.41**	23.3
		1#2	23.26	23.34	23.27
		1#5	23.17	23.31	23.2
		3#0	23.19	23.34	23.29
		3#1	23.12	23.29	23.19
		3#2	23.11	23.19	23.18
		6#0	23.05	23.15	23.08
	16-QAM	1#0	23.2	23.24	23.19
		1#2	23.25	23.27	23.24
		1#5	23.1	23.3	23.13
		3#0	23.15	23.3	23.19
		3#1	23.06	23.19	23.11
		3#2	23.07	23.09	23.16
		5#0	22.96	23.08	23.07
5M	QPSK	1#0	23.31	23.35	23.28
		1#2	23.24	23.26	23.24
		1#5	23.1	23.29	23.13
		3#0	23.09	23.26	23.26
		3#1	23.07	23.29	23.18
		3#2	23.1	23.09	23.08
		6#0	22.97	23.08	23.08
	16-QAM	1#0	23.19	23.16	23.17
		1#2	23.23	23.25	23.23
		1#5	23.04	23.23	23.04
		3#0	23.07	23.25	23.13
		3#1	22.97	23.18	23.04
		3#2	23.01	23.07	23.07
		5#0	22.91	23.07	23.02

3M	QPSK	1#0	23.23	23.35	23.2
		1#2	23.21	23.16	23.17
		1#5	23.1	23.28	23.08
		3#0	23.04	23.21	23.19
		3#1	22.98	23.28	23.11
		3#2	23.01	23.09	22.98
		6#0	22.87	23.04	23.03
	16-QAM	1#0	23.19	23.09	23.1
		1#2	23.23	23.15	23.17
		1#5	22.96	23.22	22.99
		3#0	23.06	23.18	23.05
		3#1	22.97	23.11	22.96
		3#2	22.97	22.98	23.02
		5#0	22.89	23.07	22.96
1.4M	QPSK	1#0	23.22	23.28	23.18
		1#2	23.18	23.1	23.1
		1#5	23.02	23.25	22.98
		3#0	22.97	23.18	23.13
		3#1	22.96	23.28	23.05
		3#2	22.97	23.03	22.94
		6#0	22.86	22.94	23.01
	16-QAM	1#0	23.11	23	23.07
		1#2	23.18	23.14	23.09
		1#5	22.9	23.21	22.99
		3#0	22.98	23.17	23.02
		3#1	22.88	23.04	22.9
		3#2	22.89	22.92	23
		5#0	22.83	23.04	22.9

Note:

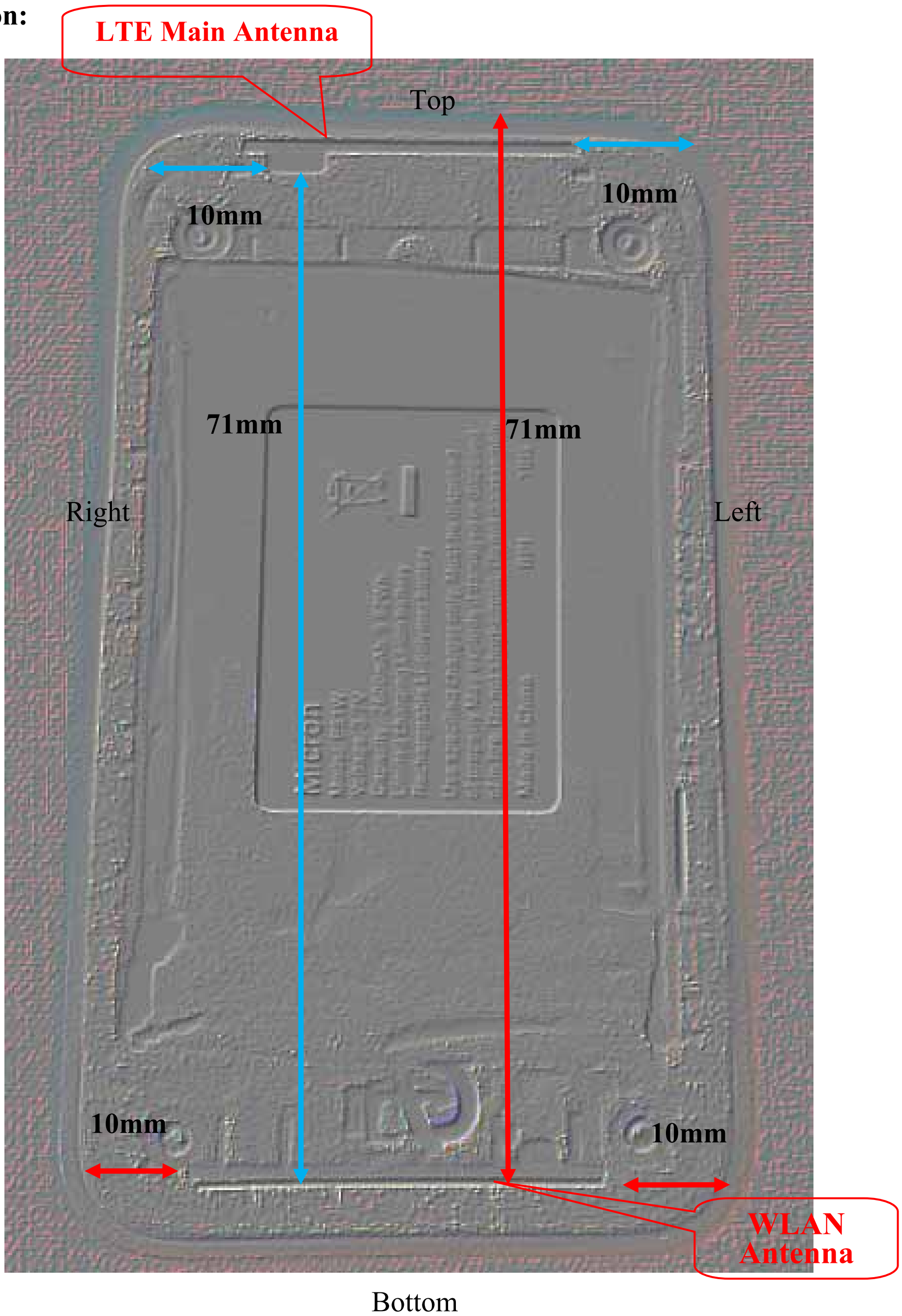
1. SAR for LTE band exposure configurations is measured according to the procedures of KDB 941225 D05 SAR for LTE Devices v02.
2. KDB941225D05- Start with the largest channel bandwidth and measure SAR for QPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power among RB offset the upper edge, middle and lower edge of each required test channel.
3. When the 1-g SAR is ≤ 0.8W/kg, testing for other channels are optional.
4. Worst case SAR for 50% RB allocation is selected to be tested.
5. KDB941225D05- For QPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations and the highest reported SAR for 1 RB and 50% RB allocation are ≤ 0.8 W/kg.
6. KDB941225D05-For QPSK with 100% RB allocation, when the reported SAR measured for the Highest output power channel is <1.45 W/kg, tests for the remaining required test channels are optional.
7. KDB941225D05- other channel bandwidths SAR test is required when the highest maximum output power of a configuration requiring testing in the smaller channel bandwidth is > ½ dB higher than the equivalent channel configurations in the largest channel bandwidth configuration or the reported SAR of a configuration for the largest channel bandwidth is > 1.45 W/kg.
8. KDB941225D05-SAR for higher order modulation is required only when the highest maximum output power for the configuration in the higher order modulation is > ½ dB higher than the same configuration in QPSK or when the reported SAR for the QPSK configuration is > 1.45 W/kg
9. KDB 648474 D04-When the peak SAR located in regions that probe is unable to access, a flat phantom is used for SAR measurement.

WLAN 2.4GHz:

Mode	Channel frequency	Data Rate	RF Output Power
802.11b	2412	1Mbps	12.32
	2437		**12.51**
	2462		12.43
802.11g	2412	6Mbps	11.18
	2437		11.37
	2462		11.42
802.11n HT20	2412	MCS0	11.22
	2437		11.31
	2462		11.42
802.11n HT40	2442	MCS0	11.34
	2437		11.41
	2452		11.53

Standalone SAR test exclusion considerations

Antennas Location:



Antenna Distance To Edge

Antenna Distance To Edge(mm)						
Antenna	**Front**	**Back**	**Left Side**	**Right Side**	**Top Side**	**BottomSide**
LTE	<5	<5	10	10	<5	71
WLAN	<5	<5	10	10	71	<5

Standalone SAR test exclusion considerations

Mode	Frequency (MHz)	Pavg (dBm)	Pavg (mW)	Min. Test Distance (mm)	Calculated value	Threshold (1-g)	SAR Test Exclusion
LTE Band 2	1880	24	251	0	68.83	3.0	No
LTE Band 4	1732.5	24	251	0	66.09	3.0	No
LTE Band 12	707.5	24	251	0	42.3	3.0	No
WLAN 2.4G	2437	13	20	0	6.24	3.0	No

NOTE:
The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:
[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] · [√f(GHz)] ≤ 3.0 for 1-g SAR and ≤7.5 for 10-g extremity SAR, where
1. f(GHz) is the RF channel transmit frequency in GHz.
2. Power and distance are rounded to the nearest mW and mm before calculation.
3. The result is rounded to one decimal place for comparison.
4. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test Exclusion.

SAR test exclusion for the EUT edge considerations Result

SAR Test Exclusion for the EUT Edges Considerations						
Mode	**Front**	**Back**	**Left Side**	**Right Side**	**Top Side**	**Bottom Side**
LTE Antenna	Required	Required	Required	Required	Required	Exemption
Wi-Fi Antenna	Required	Required	Required	Required	Exemption	Required

Note:
Required: The distance is less than 25mm, the SAR test is required as Standalone SAR test exclusion considerations table.
Exemption: The distance is more than 25mm, according to KDB 941225 D06, the Standalone SAR test is not required.
Exclusion: In normal operation mode, the Edge(s) will not be touched by the users directly, so SAR test is not consideration.
Exclusion*: SAR test exclusion evaluation has been done above.

SAR MEASUREMENT RESULTS

This page summarizes the results of the performed dosimetric evaluation.

SAR Test Data

Environmental Conditions

Temperature:	22.3-22.6 ℃	22.3-22.9 ℃	22.1-22.5 ℃
Relative Humidity:	47 %	45 %	51 %
ATM Pressure:	99.1 kPa	99.6 kPa	99.9 kPa
Test Date:	2019/1/2	2019/1/3	2019/1/15

Testing was performed by Angelo Chang

LTE Band :

Plot No.	Band	BW (MHz)	Modulation	Test Mode	Test Position	Gap (mm)	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)	Corrected SAR
1	LTE Band 12	10	QPSK	1 RB	Head Face UP	5	707.5	23.41	24.00	0.09	0.353	0.404	0.41
2	LTE Band 12	10	QPSK	3 RB	Head Face UP	5	707.5	23.34	24.00	0.06	0.314	0.366	0.37
3	LTE Band 12	10	QPSK	1 RB	Head Face UP	5	704	23.33	24.00	0.1	0.270	0.315	0.32
4	LTE Band 12	10	QPSK	1 RB	Head Face UP	5	711	23.30	24.00	-0.1	0.311	0.365	0.37
16	LTE Band 12	10	QPSK	1 RB	Front	0	707.5	23.41	24.00	0.1	0.674	0.772	**0.78**
17	LTE Band 12	10	QPSK	3 RB	Front	0	707.5	23.34	24.00	0.08	0.658	0.766	0.77
18	LTE Band 12	10	QPSK	1 RB	Back	0	707.5	23.41	24.00	-0.06	0.351	0.402	0.41
19	LTE Band 12	10	QPSK	3 RB	Back	0	707.5	23.34	24.00	-0.19	0.339	0.395	0.40
20	LTE Band 12	10	QPSK	1 RB	Left Side	0	707.5	23.41	24.00	-0.1	0.632	0.724	0.73
21	LTE Band 12	10	QPSK	3 RB	Left Side	0	707.5	23.34	24.00	-0.15	0.649	0.756	0.76
22	LTE Band 12	10	QPSK	1 RB	Right Side	0	707.5	23.41	24.00	0.08	0.652	0.747	0.75
23	LTE Band 12	10	QPSK	3 RB	Right Side	0	707.5	23.34	24.00	0.12	0.480	0.559	0.56
24	LTE Band 12	10	QPSK	1 RB	Top Side	0	707.5	23.41	24.00	0.06	0.257	0.294	0.30
25	LTE Band 12	10	QPSK	3 RB	Top Side	0	707.5	23.34	24.00	-0.13	0.247	0.288	0.29
26	LTE Band 12	10	QPSK	1 RB	Front	0	704	23.33	24.00	0.12	0.623	0.727	0.73
27	LTE Band 12	10	QPSK	3 RB	Front	0	704	23.19	24.00	0.02	0.611	0.736	0.74
28	LTE Band 12	10	QPSK	1 RB	Front	0	711	23.30	24.00	0.06	0.655	0.770	0.77
29	LTE Band 12	10	QPSK	3 RB	Front	0	711	23.29	24.00	0.04	0.642	0.756	0.76

Plot No.	Band	BW (MHz)	Modulation	Test Mode	Test Position	Gap (mm)	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)	Corrected SAR
5	LTE Band 4	20	QPSK	1 RB	Head Face UP	5	1732.5	23.40	24.00	-0.11	0.081	0.093	0.10
6	LTE Band 4	20	QPSK	3 RB	Head Face UP	5	1732.5	23.33	24.00	-0.15	0.078	0.091	0.10
7	LTE Band 4	20	QPSK	1 RB	Head Face UP	5	1720	23.35	24.00	-0.11	0.075	0.087	0.09
8	LTE Band 4	20	QPSK	1 RB	Head Face UP	5	1745	23.11	24.00	0.05	0.108	0.133	0.14
30	LTE Band 4	20	QPSK	1 RB	Front	0	1732.5	23.40	24.00	0.15	0.334	0.383	0.39
31	LTE Band 4	20	QPSK	3 RB	Front	0	1732.5	23.33	24.00	0.02	0.330	0.385	0.39
32	LTE Band 4	20	QPSK	1 RB	Back	0	1732.5	23.40	24.00	-0.05	0.369	0.424	0.43
33	LTE Band 4	20	QPSK	3 RB	Back	0	1732.5	23.33	24.00	-0.03	0.374	0.436	0.44
34	LTE Band 4	20	QPSK	1 RB	Left Side	0	1732.5	23.40	24.00	0.01	0.256	0.294	0.30
35	LTE Band 4	20	QPSK	3 RB	Left Side	0	1732.5	23.33	24.00	-0.08	0.233	0.272	0.28
36	LTE Band 4	20	QPSK	1 RB	Right Side	0	1732.5	23.40	24.00	-0.03	0.237	0.272	0.28
37	LTE Band 4	20	QPSK	3 RB	Right Side	0	1732.5	23.33	24.00	0.16	0.216	0.252	0.26
38	LTE Band 4	20	QPSK	1 RB	Top Side	0	1732.5	23.40	24.00	-0.02	0.486	0.558	0.56
39	LTE Band 4	20	QPSK	3 RB	Top Side	0	1732.5	23.33	24.00	0	0.434	0.506	0.51
40	LTE Band 4	20	QPSK	1 RB	Top Side	0	1720	23.35	24.00	0.02	0.434	0.504	0.51
41	LTE Band 4	20	QPSK	3 RB	Top Side	0	1720	23.09	24.00	0.01	0.409	0.504	0.51
42	LTE Band 4	20	QPSK	1 RB	Top Side	0	1745	23.11	24.00	-0.04	0.486	0.597	**0.60**
43	LTE Band 4	20	QPSK	3 RB	Top Side	0	1745	23.08	24.00	0.01	0.472	0.583	0.59
9	LTE Band 2	20	QPSK	1 RB	Head Face UP	5	1880	23.40	24.00	-0.11	0.199	0.228	0.23
10	LTE Band 2	20	QPSK	3 RB	Head Face UP	5	1880	23.36	24.00	-0.07	0.189	0.219	0.22
11	LTE Band 2	20	QPSK	1 RB	Head Face UP	5	1860	23.35	24.00	-0.06	0.225	0.261	0.27
12	LTE Band 2	20	QPSK	1 RB	Head Face UP	5	1900	23.19	24.00	-0.12	0.180	0.217	0.22
44	LTE Band 2	20	QPSK	1 RB	Front	0	1880	23.40	24.00	-0.05	0.618	0.710	0.71
45	LTE Band 2	20	QPSK	3 RB	Front	0	1880	23.36	24.00	-0.01	0.596	0.691	0.70
46	LTE Band 2	20	QPSK	1 RB	Back	0	1880	23.40	24.00	0.02	0.459	0.527	0.53
47	LTE Band 2	20	QPSK	3 RB	Back	0	1880	23.36	24.00	-0.18	0.423	0.490	0.49
48	LTE Band 2	20	QPSK	1 RB	Left Side	0	1880	23.40	24.00	0.01	0.630	0.723	0.73
49	LTE Band 2	20	QPSK	3 RB	Left Side	0	1880	23.36	24.00	0.11	0.586	0.679	0.68
50	LTE Band 2	20	QPSK	1 RB	Right Side	0	1880	23.40	24.00	-0.02	0.657	0.754	0.76
51	LTE Band 2	20	QPSK	3 RB	Right Side	0	1880	23.36	24.00	0.03	0.632	0.732	0.74
52	LTE Band 2	20	QPSK	1 RB	Top Side	0	1880	23.40	24.00	-0.19	0.497	0.571	0.58
53	LTE Band 2	20	QPSK	3 RB	Top Side	0	1880	23.36	24.00	-0.19	0.473	0.548	0.55
54	LTE Band 2	20	QPSK	1 RB	Right Side	0	1860	23.35	24.00	-0.03	0.742	0.862	**0.87**
55	LTE Band 2	20	QPSK	3 RB	Right Side	0	1860	23.32	24.00	0.19	0.695	0.813	0.82
56	LTE Band 2	20	QPSK	1 RB	Right Side	0	1900	23.19	24.00	-0.04	0.661	0.797	0.80
57	LTE Band 2	20	QPSK	3 RB	Right Side	0	1900	23.18	24.00	-0.05	0.612	0.739	0.74

Note:

1. SAR for LTE band exposure configurations is measured according to the procedures of KDB 941225 D05 SAR for LTE Devices v02.
2. KDB941225D05- Start with the largest channel bandwidth and measure SAR for QPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power among RB offset the upper edge, middle and lower edge of each required test channel.
3. When the 1-g SAR is ≤ 0.8W/kg, testing for other channels are optional.
4. Worst case SAR for 50% RB allocation is selected to be tested.
5. KDB941225D05- For QPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations and the highest reported SAR for 1 RB and 50% RB allocation are ≤ 0.8 W/kg.
6. KDB941225D05-For QPSK with 100% RB allocation, when the reported SAR measured for the Highest output power channel is <1.45 W/kg, tests for the remaining required test channels are optional.
7. KDB941225D05- other channel bandwidths SAR test is required when the highest maximum output power of a configuration requiring testing in the smaller channel bandwidth is > ½ dB higher than the equivalent channel configurations in the largest channel bandwidth configuration or the reported SAR of a configuration for the largest channel bandwidth is > 1.45 W/kg.
8. KDB941225D05-SAR for higher order modulation is required only when the highest maximum output power for the configuration in the higher order modulation is > ½ dB higher than the same configuration in QPSK or when the reported SAR for the QPSK configuration is > 1.45 W/kg
9. KDB 648474 D04-When the peak SAR located in regions that probe is unable to access, a flat phantom is used for SAR measurement.

WLAN 2.4G:

Plot No.	Band	Mode	Test Position	Gap (mm)	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)	Corrected SAR
13	WLAN2.4GHz	802.11b 1Mbps	Head Face UP	5	2437	12.51	13.00	-0.11	0.178	0.183	0.19
14	WLAN2.4GHz	802.11b 1Mbps	Head Face UP	5	2412	12.32	13.00	0.01	0.237	0.277	0.28
15	WLAN2.4GHz	802.11b 1Mbps	Head Face UP	5	2462	12.43	13.00	0.02	0.253	0.288	0.29
58	WLAN2.4GHz	802.11b 1Mbps	Front	0	2437	12.51	13.00	0.09	0.379	0.183	0.19
59	WLAN2.4GHz	802.11b 1Mbps	Back	0	2437	12.51	13.00	0.02	0.071	0.079	0.08
60	WLAN2.4GHz	802.11b 1Mbps	Left Side	0	2437	12.51	13.00	0.02	0.082	0.092	0.10
61	WLAN2.4GHz	802.11b 1Mbps	Right Side	0	2437	12.51	13.00	0.03	0.084	0.094	0.10
62	WLAN2.4GHz	802.11b 1Mbps	Bottom Side	0	2437	12.51	13.00	0.09	0.455	0.509	0.51
63	WLAN2.4GHz	802.11b 1Mbps	Bottom Side	0	2412	12.32	13.00	0.04	0.442	0.517	**0.52**
64	WLAN2.4GHz	802.11b 1Mbps	Bottom Side	0	2462	12.43	13.00	0.06	0.441	0.503	0.51

Note:

1. When the 1-g SAR is≤ 0.8W/kg, testing for other channels are optional.
2. When SAR or MPE is not measured at the maximum power level allowed for production units, the results must be scaled to the maximum tune-up tolerance limit according to the power applied to the individual channels tested to determine compliance.
3. KDB 248227 D01-SAR measurement is not required for 2.4 GHz OFDM(801.11g/n) when the highest reported SAR for DSSS(802.11b) is ≤ 1.2 W/kg, and the output power for DSSS is not less than that for OFDM.

Corrected SAR Evaluation

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Annex F
(normative)

SAR correction for deviations of complex permittivity from targets

F.2 SAR correction formula

From [13] and [14], a linear relationship was found between the percent change in SAR (denoted ΔSAR) and the percent change in the permittivity and conductivity from the target values in Table 1 (denoted $\Delta\varepsilon_r$ and $\Delta\sigma$, respectively). This linear relationship agrees with the results of Kuster and Balzano [48] and Bit-Babik et al. [2]. The relationship is given by:

$$\Delta \mathrm{SAR} = c_\varepsilon \, \Delta\varepsilon_r + c_\sigma \, \Delta\sigma \qquad \text{(F.1)}$$

where

$c_\varepsilon = \partial(\Delta\mathrm{SAR})/\partial(\Delta\varepsilon)$ is the coefficients representing the sensitivity of SAR to permittivity where SAR is normalized to output power;

$c_\sigma = \partial(\Delta\mathrm{SAR})/\partial(\Delta\sigma)$ is the coefficients representing the sensitivity of SAR to conductivity, where SAR is normalized to output power.

The values of c_ε and c_σ have a simple relationship with frequency that can be described using polynomial equations. For the 1 g averaged SAR c_ε and c_σ are given by

$$c_\varepsilon = -7{,}854 \times 10^{-4} f^3 + 9{,}402 \times 10^{-3} f^2 - 2{,}742 \times 10^{-2} f - 0{,}202\,6 \qquad \text{(F.2)}$$

$$c_\sigma = 9{,}804 \times 10^{-3} f^3 - 8{,}661 \times 10^{-2} f^2 + 2{,}981 \times 10^{-2} f + 0{,}782\,9 \qquad \text{(F.3)}$$

where

f is the frequency in GHz.

For the 10 g averaged SAR, the variables c_ε and c_σ are given by:

$$c_\varepsilon = 3{,}456 \times 10^{-3} f^3 - 3{,}531 \times 10^{-2} f^2 + 7{,}675 \times 10^{-2} f - 0{,}186\,0 \qquad \text{(F.4)}$$

$$c_\sigma = 4{,}479 \times 10^{-3} f^3 - 1{,}586 \times 10^{-2} f^2 - 0{,}197\,2 f + 0{,}771\,7 \qquad \text{(F.5)}$$

Corrected SAR Evaluation Table :

Frequency (MHz)	Liquid Type	C ε	△ ε r	C δ	△ δ	△SAR (%)
1720	Body	-0.226	-0.11	0.628	-4.01	-2.49
1732.5	Body	-0.226	0.03	0.626	-4.74	-2.97
1745	Body	-0.226	-0.26	0.623	-3.03	-1.83
1860	Body	-0.226	3.75	0.602	2.11	0.42
1880	Body	-0.226	3.88	0.598	0.72	-0.45
1900	Body	-0.226	-0.15	0.594	1.39	0.86
2412	Body	-0.225	-1.33	0.489	1.02	-0.88
2437	Body	-0.225	0.41	0.483	0.84	0.01
2462	Body	-0.225	2.1	0.482	0.65	0.86

Test Date 2019-1-02.

Frequency (MHz)	Liquid Type	C ε	△ ε r	C δ	△ δ	△SAR (%)
1720	Head	-0.226	0.04	0.628	-0.74	-0.47
1732.5	Head	-0.226	0.09	0.626	0.22	0.12
1745	Head	-0.226	-0.12	0.623	0.36	0.25
1860	Head	-0.226	3.78	0.602	0.86	-0.34
1880	Head	-0.226	3.57	0.598	2.29	0.56
1900	Head	-0.226	3.38	0.594	3.79	1.49
2412	Head	-0.225	-2.96	0.489	3.84	2.54
2437	Head	-0.225	-3.01	0.483	4.08	2.65
2462	Head	-0.225	-3.41	0.482	4.59	2.96

Test Date 2019-1-03.

Frequency (MHz)	Liquid Type	C ε	△ε r	C δ	△δ	△SAR (%)
704	Body	-0.218	4.03	0.764	-2.25	-2.60
708	Body	-0.218	4.16	0.764	-1.91	-2.36
711	Body	-0.218	4.05	0.764	-1.57	-2.08
704	Head	-0.218	4.03	0.764	-2.25	-2.60
708	Head	-0.218	4.16	0.764	-1.91	-2.36
711	Head	-0.218	4.05	0.764	-1.57	-2.08

Test Date 2019-1-15

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$$\Delta SAR = c_\varepsilon \; \Delta\varepsilon_r + c_\sigma \; \Delta\sigma$$

$$c_\varepsilon = -7{,}854 \times 10^{-4} f^3 + 9{,}402 \times 10^{-3} f^2 - 2{,}742 \times 10^{-2} f - 0{,}202\,6$$

$$c_\sigma = 9{,}804 \times 10^{-3} f^3 - 8{,}661 \times 10^{-2} f^2 + 2{,}981 \times 10^{-2} f + 0{,}782\,9$$

where

f is the frequency in GHz.

Corrected SAR = Measured SAR * ((100 + (ΔSAR x -1)) /100)

SAR Measurement Variability

In accordance with published RF Exposure KDB procedure 865664 D01 SAR measurement 100 MHz to 6 GHz v01. These additional measurements are repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device should be returned to ambient conditions (normal room temperature) with the battery fully charged before it is re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results

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

Note: 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.

The Highest Measured SAR Configuration in Each Frequency Band

Head

SAR probe calibration point	Frequency Band	Freq.(MHz)	EUT Position	Meas. SAR (W/kg)		Largest to Smallest SAR Ratio
				Original	Repeated	
/	/	/	/	/	/	/

Body

SAR probe calibration point	Frequency Band	Freq.(MHz)	EUT Position	Meas. SAR (W/kg)		Largest to Smallest SAR Ratio
				Original	Repeated	
/	/	/	/	/	/	/

Note:

1. Second Repeated Measurement is not required since the ratio of the largest to smallest SAR for the original and first repeated measurement is not > 1.20.
2. The measured SAR results **do not** have to be scaled to the maximum tune-up tolerance to determine if repeated measurements are required.
3. SAR measurement variability must be assessed for each frequency band, which is determined by the **SAR probe calibration point and tissue-equivalent medium** used for the device measurements..

SAR SIMULTANEOUS TRANSMISSION DESCRIPTION

Simultaneous Transmission:

Description of Simultaneous Transmit Capabilities		
Transmitter Combination	**Simultaneous?**	**Hotspot?**
LTE + WLAN	√	x

Note:

1. *The EUT support WWAN(LTE) and WLAN(Wi-Fi 2.4GHz) technology.*
2. *The EUT contains 2 RF transmitting antennas(1 for WWAN and 1 for WLAN).*
3. *The 2 WLAN antennas can transmit simultaneously.*

Simultaneous and Hotspot SAR test exclusion considerations:

Mode(SAR1+SAR2)	Position	Reported SAR(W/kg)		ΣSAR < 1.6W/kg
		SAR1	SAR2	
LTE Band 2+ WLAN	Head Face UP	0.27	0.29	0.56
	Front	0.71	0.19	0.90
	Back	0.53	0.08	0.61
	Left Side	0.73	0.1	0.83
	Right Side	0.87	0.1	**0.97**
	Top Side	0.58	/	/
LTE Band 4+ WLAN	Head Face UP	041	0.29	**0.70**
	Front	0.78	0.19	0.97
	Back	0.41	0.08	0.49
	Left Side	0.76	0.1	0.86
	Right Side	0.75	0.1	0.85
	Top Side	0.30	/	/
LTE Band 12 + WLAN	Head Face UP	0.04	0.29	0.24
	Front	0.24	0.19	0.33
	Back	0.03	0.08	0.43
	Left Side	0.02	0.1	0.11
	Right Side	0.03	0.1	0.12
	Top Side	0.13	/	/

Conclusion:

Sum of SAR: **ΣSAR ≤ 1.6 W/kg** therefore simultaneous transmission SAR with Volume Scans is **not required**.

APPENDIX A MEASUREMENT UNCERTAINTY

The uncertainty budget has been determined for the measurement system and is given in the following Table.

Measurement uncertainty evaluation for IEEE1528-2013 SAR test

Source of uncertainty	Tolerance/ uncertainty ± %	Probability distribution	Divisor	ci (1 g)	ci (10 g)	Standard uncertainty ± %, (1 g)	Standard uncertainty ± %, (10 g)
Measurement system							
Probe calibration	6.55	N	1	1	1	6.6	6.6
Axial Isotropy	4.7	R	√3	1	1	2.7	2.7
Hemispherical Isotropy	9.6	R	√3	0	0	0.0	0.0
Boundary effect	1.0	R	√3	1	1	0.6	0.6
Linearity	4.7	R	√3	1	1	2.7	2.7
Detection limits	1.0	R	√3	1	1	0.6	0.6
Readout electronics	0.3	N	1	1	1	0.3	0.3
Response time	0.0	R	√3	1	1	0.0	0.0
Integration time	0.0	R	√3	1	1	0.0	0.0
RF ambient conditions – noise	1.0	R	√3	1	1	0.6	0.6
RF ambient conditions–reflections	1.0	R	√3	1	1	0.6	0.6
Probe positioner mech. Restrictions	0.8	R	√3	1	1	0.5	0.5
Probe positioning with respect to phantom shell	6.7	R	√3	1	1	3.9	3.9
Post-processing	2.0	R	√3	1	1	1.2	1.2
Test sample related							
Test sample positioning	2.8	N	1	1	1	2.8	2.8
Device holder uncertainty	6.3	N	1	1	1	6.3	6.3
Drift of output power	5.0	R	√3	1	1	2.9	2.9
Phantom and set-up							
Phantom uncertainty (shape and thickness tolerances)	4.0	R	√3	1	1	2.3	2.3
Liquid conductivity target)	5.0	R	√3	0.64	0.43	1.8	1.2
Liquid conductivity meas.)	2.5	N	1	0.64	0.43	1.6	1.1
Liquid permittivity target)	5.0	R	√3	0.6	0.49	1.7	1.4
Liquid permittivity meas.)	2.5	N	1	0.6	0.49	1.5	1.2
Combined standard uncertainty		RSS				12.2	12.0
Expanded uncertainty 95 % confidence interval)						24.3	23.9

Measurement uncertainty evaluation for IEC62209-2 SAR test

Source of uncertainty	Tolerance/ uncertainty ± %	Probability distribution	Divisor	ci (1 g)	ci (10 g)	Standard uncertainty ± %, (1 g)	Standard uncertainty ± %, (10 g)
Measurement system							
Probe calibration	6.55	N	1	1	1	6.6	6.6
Axial Isotropy	4.7	R	√3	1	1	2.7	2.7
Hemispherical Isotropy	9.6	R	√3	0	0	0.0	0.0
Linearity	4.7	R	√3	1	1	2.7	2.7
Modulation Response	0.0	R	√3	1	1	0.0	0.0
Detection limits	1.0	R	√3	1	1	0.6	0.6
Boundary effect	1.0	R	√3	1	1	0.6	0.6
Readout electronics	0.3	N	1	1	1	0.3	0.3
Response time	0.0	R	√3	1	1	0.0	0.0
Integration time	0.0	R	√3	1	1	0.0	0.0
RF ambient conditions – noise	1.0	R	√3	1	1	0.6	0.6
RF ambient conditions–reflections	1.0	R	√3	1	1	0.6	0.6
Probe positioner mech. Restrictions	0.8	R	√3	1	1	0.5	0.5
Probe positioning with respect to phantom shell	6.7	R	√3	1	1	3.9	3.9
Post-processing	2.0	R	√3	1	1	1.2	1.2
Test sample related							
Device holder Uncertainty	6.3	N	1	1	1	6.3	6.3
Test sample positioning	2.8	N	1	1	1	2.8	2.8
Power scaling	4.5	R	√3	1	1	2.6	2.6
Drift of output power	5.0	R	√3	1	1	2.9	2.9
Phantom and set-up							
Phantom uncertainty (shape and thickness tolerances)	4.0	R	√3	1	1	2.3	2.3
Algorithm for correcting SAR for deviations in permittivity and conductivity	1.9	N	1	1	0.84	1.1	0.9
Liquid conductivity (meas.)	2.5	N	1	0.64	0.43	1.6	1.1
Liquid permittivity (meas.)	2.5	N	1	0.6	0.49	1.5	1.2
Temp. unc. - Conductivity	1.7	R	√3	0.78	0.71	0.8	0.7
Temp. unc. - Permittivity	0.3	R	√3	0.23	0.26	0.0	0.0
Combined standard uncertainty		RSS				12.2	12.1
Expanded uncertainty 95 % confidence interval)						24.5	24.2

APPENDIX B EUT TEST POSITION PHOTOS

Please refer to the file document of RXZ18101204-23A

APPENDIX B EUT TEST POSITION PHOTOS.

APPENDIX C SAR PLOTS OF SAR MEASUREMENT

Please refer to the file document of RXZ18101204-23A

APPENDIX C SAR PLOTS OF SAR MEASUREMENT.

APPENDIX D CALIBRATION CERTIFICATES

Please refer to the file document of RXZ18101204-23A

APPENDIX D CALIBRATION CERTIFICATES.

******* END OF REPORT *******