FCC SAR Test Report

APPLICANT	:	**Honeywell International Inc.** **Honeywell Safety and Productivity Solutions**
EQUIPMENT	:	**RT10A**
BRAND NAME	:	**Honeywell**
Model Name	:	**RT10AL1N**
FCC ID	:	**HD5-RT10AL1N**
STANDARD	:	**FCC 47 CFR Part 2 (2.1093)**

We, Sporton International Inc. (Kunshan), would like to declare that the tested sample has been evaluated in accordance with the test procedures given in 47 CFR Part 2.1093 and FCC KDB and has been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International Inc. (Kunshan), the test report shall not be reproduced except in full.

Si Zhang

Approved by: Si Zhang

ACCREDITED Cert #5145.02

Sporton International Inc. (Kunshan)
No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300
People's Republic of China

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History of this test report

Report No.	Version	Description	Issued Date
FA052222-05	Rev. 01	Initial issue of report	Jun. 28, 2022

1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for **Honeywell International Inc. Honeywell Safety and Productivity Solutions, RT10A, RT10AL1N,** are as follows.

Highest Standalone 1g SAR Summary			
Equipment Class	Frequency Band		Body 1g SAR (W/kg)
Licensed	GSM	GSM850	1.03
	LTE	Band 25/Band 2	1.13
		Band 4	0.98
		Band 12/Band 17	1.13
		Band 41/Band 38	0.87
DTS	WLAN	2.4GHz WLAN	0.67
NII		5GHz WLAN	**1.31**
DSS	Bluetooth	Bluetooth	<0.10
Date of Testing:		2022/6/1~2022/6/11	

Remark:
1. This device supports LTE B2 / B17 / B38 and B25 / B12 / B41. Since the supported frequency span for LTE B2 / B17 / B38 falls completely within the supports frequency span for LTE B25 / B12 / B41, both LTE bands have the same target power, and both LTE bands share the same transmission path; therefore, SAR was only assessed for LTE B25 / B12 / B41.
2. This is a variant report for RT10AL1N, the change note please refer to the RT10AL1N_Operational Description of Product Equality Declaration exhibit submitted. Based on the similarity between two models, only the worst cases from original test report (Sporton Report Number FA052222) were verified for the differences.

Declaration of Conformity:
The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.
Comments and Explanations:
The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

This device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6 W/kg for Partial-Body 1g SAR) specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-1992, and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2013 and FCC KDB publications

2. Administration Data

Sporton International Inc. (Kunshan) is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.02.

Testing Laboratory			
Test Firm	Sporton International Inc. (Kunshan)		
Test Site Location	No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300 People's Republic of China TEL : +86-512-57900158 FAX : +86-512-57900958		
Test Site No.	Sporton Site No.	FCC Designation No.	FCC Test Firm Registration No.
	SAR03-KS	CN1257	314309

Applicant	
Company Name	Honeywell International Inc. Honeywell Safety and Productivity Solutions
Address	9680 Old Bailes Rd. Fort Mill, SC 29707 United States

Manufacturer	
Company Name	Honeywell International Inc. Honeywell Safety and Productivity Solutions
Address	9680 Old Bailes Rd. Fort Mill, SC 29707 United States

3. Guidance Applied

The Specific Absorption Rate (SAR) testing specification, method, and procedure for this device is in accordance with the following standards:

- FCC 47 CFR Part 2 (2.1093)
- ANSI/IEEE C95.1-1992
- IEEE 1528-2013
- FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04
- FCC KDB 865664 D02 SAR Reporting v01r02
- FCC KDB 447498 D01 General RF Exposure Guidance v06
- FCC KDB 248227 D01 802.11 Wi-Fi SAR v02r02
- FCC KDB 616217 D04 SAR for laptop and tablets v01r02
- FCC KDB 941225 D01 3G SAR Procedures v03r01
- FCC KDB 941225 D05 SAR for LTE Devices v02r05
- FCC KDB 941225 D05A Rel.10 LTE SAR Test Guidance v01r02

4. Equipment Under Test (EUT) Information

4.1 General Information

Product Feature & Specification	
Equipment Name	RT10A
Brand Name	Honeywell
Model Name	RT10AL1N
FCC ID	HD5-RT10AL1N
IMEI Code	990016020108104
Wireless Technology and Frequency Range	GSM850: 824.2 MHz ~ 848.8 MHz GSM1900: 1850.2 MHz ~ 1909.8 MHz WCDMA Band II: 1852.4 MHz ~ 1907.6 MHz WCDMA Band IV: 1712.4 MHz ~ 1752.6 MHz WCDMA Band V: 826.4 MHz ~ 846.6 MHz CDMA2000 BC0: 824.7 MHz ~ 848.31 MHz CDMA 2000 BC1: 1851.25 MHz ~ 1908.75 MHz CDMA 2000 BC10: 817.9 MHz ~ 823.1 MHz LTE Band 2: 1850.7 MHz ~ 1909.3 MHz LTE Band 4: 1710.7 MHz ~ 1754.3 MHz LTE Band 5: 824.7 MHz ~ 848.3 MHz LTE Band 7: 2502.5 MHz ~ 2567.5 MHz LTE Band 12: 699.7 MHz ~ 715.3 MHz LTE Band 13: 779.5 MHz ~ 784.5 MHz LTE Band 17: 706.5 MHz ~ 713.5 MHz LTE Band 25: 1850.7 MHz ~ 1914.3 MHz LTE Band 26: 814.7 MHz ~ 848.3 MHz LTE Band 38: 2572.5 MHz ~ 2617.5 MHz LTE Band 41: 2498.5 MHz ~ 2687.5 MHz WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz WLAN 5.2GHz Band: 5180 MHz ~ 5240 MHz WLAN 5.3GHz Band: 5260 MHz ~ 5320 MHz WLAN 5.5GHz Band: 5500 MHz ~ 5720 MHz WLAN 5.8GHz Band: 5745 MHz ~ 5825 MHz Bluetooth: 2402 MHz ~ 2480 MHz NFC : 13.56 MHz
Mode	GPRS/EGPRS RMC 12.2Kbps HSDPA HSUPA DC-HSDPA HSPA+ (16QAM uplink is not supported) CDMA2000 : 1xEv-Do(Rev.0)/1xEv-Do(Rev.A) LTE: QPSK, 16QAM, 64QAM WLAN 2.4GHz 802.11b/g/n HT20 WLAN 5GHz 802.11a/n HT20/HT40 WLAN 5GHz 802.11ac VHT20/VHT40/VHT80 Bluetooth BR/EDR/LE NFC:ASK
HW Version	V1.0
SW Version	OS.05.001-HON.03.002.DO
EUT Stage	Identical Prototype

Remark:

1. 802.11n-HT40 is not supported in 2.4GHz WLAN.
2. The EUT has no voice function means data only.
3. This device does not support DTM operation and supports GRPS/EGRPS mode up to multi-slot class 33.
4. For WWAN transmit simultaneously with WLAN/Bluetooth, WWAN power reduction will be activated to body. Bottom and Edge 4 of WWAN performed reduced power for WWAN，for other edges full power can perform pass, no need to consider reduced power.
5. There are two types of batteries, with the same brand name and model name. We only chose higher battery capacity to do full SAR testing.

4.2 General LTE SAR Test and Reporting Considerations

<table>
<tr><th colspan="2">Summarized necessary items addressed in KDB 941225 D05 v02r05</th></tr>
<tr><td>FCC ID</td><td>HD5-RT10AL1N</td></tr>
<tr><td>Equipment Name</td><td>RT10A</td></tr>
<tr><td>Operating Frequency Range of each LTE transmission band</td><td>LTE Band 2: 1850.7 MHz ~ 1909.3 MHz
LTE Band 4: 1710.7 MHz ~ 1754.3 MHz
LTE Band 5: 824.7 MHz ~ 848.3 MHz
LTE Band 7: 2502.5 MHz ~ 2567.5 MHz
LTE Band 12: 699.7 MHz ~ 715.3 MHz
LTE Band 13: 779.5 MHz ~ 784.5 MHz
LTE Band 17: 706.5 MHz ~ 713.5 MHz
LTE Band 25: 1850.7 MHz ~ 1914.3 MHz
LTE Band 26: 814.7 MHz ~ 848.3 MHz
LTE Band 38: 2572.5 MHz ~ 2617.5 MHz
LTE Band 41: 2498.5 MHz ~ 2687.5 MHz</td></tr>
<tr><td>Channel Bandwidth</td><td>LTE Band 2:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz
LTE Band 4:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz
LTE Band 5:1.4MHz, 3MHz, 5MHz, 10MHz
LTE Band 7: 5MHz, 10MHz, 15MHz, 20MHz
LTE Band 12:1.4MHz, 3MHz, 5MHz, 10MHz
LTE Band 13: 5MHz, 10MHz
LTE Band 17: 5MHz, 10MHz
LTE Band 25:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz
LTE Band 26:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz
LTE Band 38: 5MHz, 10MHz, 15MHz, 20MHz
LTE Band 41: 5MHz, 10MHz, 15MHz, 20MHz</td></tr>
<tr><td>uplink modulations used</td><td>QPSK / 16QAM / 64QAM</td></tr>
<tr><td>LTE release</td><td>R11, Cat 6</td></tr>
<tr><td>CA support</td><td>Yes, Downlink only</td></tr>
<tr><td>LTE Voice / Data requirements</td><td>Data only</td></tr>
<tr><td>LTE MPR permanently built-in by design</td><td>Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 1, 2 and 3
<table>
<tr><th rowspan="2">Modulation</th><th colspan="6">Channel bandwidth / Transmission bandwidth (N_{RB})</th><th rowspan="2">MPR (dB)</th></tr>
<tr><th>1.4 MHz</th><th>3.0 MHz</th><th>5 MHz</th><th>10 MHz</th><th>15 MHz</th><th>20 MHz</th></tr>
<tr><td>QPSK</td><td>> 5</td><td>> 4</td><td>> 8</td><td>> 12</td><td>> 16</td><td>> 18</td><td>≤ 1</td></tr>
<tr><td>16 QAM</td><td>≤ 5</td><td>≤ 4</td><td>≤ 8</td><td>≤ 12</td><td>≤ 16</td><td>≤ 18</td><td>≤ 1</td></tr>
<tr><td>16 QAM</td><td>> 5</td><td>> 4</td><td>> 8</td><td>> 12</td><td>> 16</td><td>> 18</td><td>≤ 2</td></tr>
<tr><td>64 QAM</td><td>≤ 5</td><td>≤ 4</td><td>≤ 8</td><td>≤ 12</td><td>≤ 16</td><td>≤ 18</td><td>≤ 2</td></tr>
<tr><td>64 QAM</td><td>> 5</td><td>> 4</td><td>> 8</td><td>> 12</td><td>> 16</td><td>> 18</td><td>≤ 3</td></tr>
<tr><td>256 QAM</td><td colspan="6">≥ 1</td><td>≤ 5</td></tr>
</table></td></tr>
<tr><td>LTE A-MPR</td><td>In the base station simulator configuration, Network Setting value is set to NS_01 to disable A-MPR during SAR testing and the LTE SAR tests was transmitting on all TTI frames (Maximum TTI)</td></tr>
<tr><td>Spectrum plots for RB configuration</td><td>A properly configured base station simulator was used for the SAR and power measurement; therefore, spectrum plots for each RB allocation and offset configuration are not included in the SAR report.</td></tr>
<tr><td>Power reduction applied to satisfy SAR compliance</td><td>Yes, For WWAN when transmit simultaneous with WLAN/Bluetooth, power reduction will be activated to body.</td></tr>
<tr><td>LTE Carrier Aggregation Combinations</td><td>Inter-Band and Intra-Band possible combinations and the detail power verification please referred to section 12.</td></tr>
<tr><td>LTE Carrier Aggregation Additional Information</td><td>This device supports maximum of 2 carriers in the downlink. Additional following LTE Release features are not supported: Relay, HetNet, Enhanced MIMO, eICI, WiFi Offloading, MDH, eMBMA, Cross-Carrier Scheduling, Enhanced SC-FDMA.</td></tr>
</table>

Transmission (H, M, L) channel numbers and frequencies in each LTE band												
LTE Band 2												
	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	18607	1850.7	18615	1851.5	18625	1852.5	18650	1855	18675	1857.5	18700	1860
M	18900	1880	18900	1880	18900	1880	18900	1880	18900	1880	18900	1880
H	19193	1909.3	19185	1908.5	19175	1907.5	19150	1905	19125	1902.5	19100	1900
LTE Band 4												
	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	19957	1710.7	19965	1711.5	19975	1712.5	20000	1715	20025	1717.5	20050	1720
M	20175	1732.5	20175	1732.5	20175	1732.5	20175	1732.5	20175	1732.5	20175	1732.5
H	20393	1754.3	20385	1753.5	20375	1752.5	20350	1750	20325	1747.5	20300	1745
LTE Band 5								
	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	20407	824.7	20415	825.5	20425	826.5	20450	829
M	20525	836.5	20525	836.5	20525	836.5	20525	836.5
H	20643	848.3	20635	847.5	20625	846.5	20600	844
LTE Band 7								
	Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	20775	2502.5	20800	2505	20825	2507.5	20850	2510
M	21100	2535	21100	2535	21100	2535	21100	2535
H	21425	2567.5	21400	2565	21375	2562.5	21350	2560
LTE Band 12								
	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	23017	699.7	23025	700.5	23035	701.5	23060	704
M	23095	707.5	23095	707.5	23095	707.5	23095	707.5
H	23173	715.3	23165	714.5	23155	713.5	23130	711
LTE Band 13				
	Bandwidth 5 MHz		Bandwidth 10 MHz	
	Channel #	Freq.(MHz)	Channel #	Freq.(MHz)
L	23205	779.5	23230	782
M	23230	782		
H	23255	784.5		
LTE Band 17				
	Bandwidth 5 MHz		Bandwidth 10 MHz	
	Channel #	Freq.(MHz)	Channel #	Freq. (MHz)
L	23755	706.5	23780	709
M	23790	710	23790	710
H	23825	713.5	23800	711
LTE Band 25												
	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	26047	1850.7	26055	1851.5	26065	1852.5	26090	1855	26115	1857.5	26140	1860
M	26340	1880	26340	1880	26340	1880	26340	1880	26340	1880	26340	1880
H	26683	1914.3	26675	1913.5	26665	1912.5	26640	1910	26615	1907.5	26590	1905

LTE Band 26										
	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	26697	814.7	26705	815.5	26715	816.5	26740	819	26765	821.5
M	26865	831.5	26865	831.5	26865	831.5	26865	831.5	26865	831.5
H	27033	848.3	27025	847.5	27015	846.5	26990	844	26965	841.5

LTE Band 38								
	Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	37775	2572.5	37800	2575	37825	2577.5	37850	2580
M	38000	2595	38000	2595	38000	2595	38000	2595
H	38225	2617.5	38200	2615	38175	2612.5	38150	2610

LTE Band 41								
	Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	39675	2498.5	39700	2501	39725	2503.5	39750	2506
LM	40148	2545.8	40160	2547	40173	2548.3	40185	2549.5
M	40620	2593	40620	2593	40620	2593	40620	2593
HM	41093	2640.3	41080	2639	41068	2637.8	41055	2636.5
H	41565	2687.5	41540	2685	41515	2682.5	41490	2680

5. RF Exposure Limits

5.1 Uncontrolled Environment

Uncontrolled Environments are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure. The general population/uncontrolled exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Members of the general public would come under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity.

5.2 Controlled Environment

Controlled Environments are defined as locations where there is exposure that may be incurred by persons who are aware of the potential for exposure, (i.e. as a result of employment or occupation). In general, occupational/controlled exposure limits are applicable to situations in which persons are exposed as a consequence of their employment, who have been made fully aware of the potential for exposure and can exercise control over their exposure. The exposure category is also applicable when the exposure is of a transient nature due to incidental passage through a location where the exposure levels may be higher than the general population/uncontrolled limits, but the exposed person is fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means.

Limits for Occupational/Controlled Exposure (W/kg)

Whole-Body	Partial-Body	Hands, Wrists, Feet and Ankles
0.4	8.0	20.0

Limits for General Population/Uncontrolled Exposure (W/kg)

Whole-Body	Partial-Body	Hands, Wrists, Feet and Ankles
0.08	1.6	4.0

Whole-Body SAR is averaged over the entire body, partial-body SAR is averaged over any 1gram of tissue defined as a tissue volume in the shape of a cube. SAR for hands, wrists, feet and ankles is averaged over any 10 grams of tissue defined as a tissue volume in the shape of a cube.

6. Specific Absorption Rate (SAR)

6.1 Introduction

SAR is related to the rate at which energy is absorbed per unit mass in an object exposed to a radio field. The SAR distribution in a biological body is complicated and is usually carried out by experimental techniques or numerical modeling. The standard recommends limits for two tiers of groups, occupational/controlled and general population/uncontrolled, based on a person's awareness and ability to exercise control over his or her exposure. In general, occupational/controlled exposure limits are higher than the limits for general population/uncontrolled.

6.2 SAR Definition

The SAR definition is the time derivative (rate) of the incremental energy (dW) absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dv) of a given density (ρ). The equation description is as below:

$$\mathbf{SAR} = \frac{\mathbf{d}}{\mathbf{dt}}\left(\frac{\mathbf{dW}}{\mathbf{dm}}\right) = \frac{\mathbf{d}}{\mathbf{dt}}\left(\frac{\mathbf{dW}}{\boldsymbol{\rho}\mathbf{dv}}\right)$$

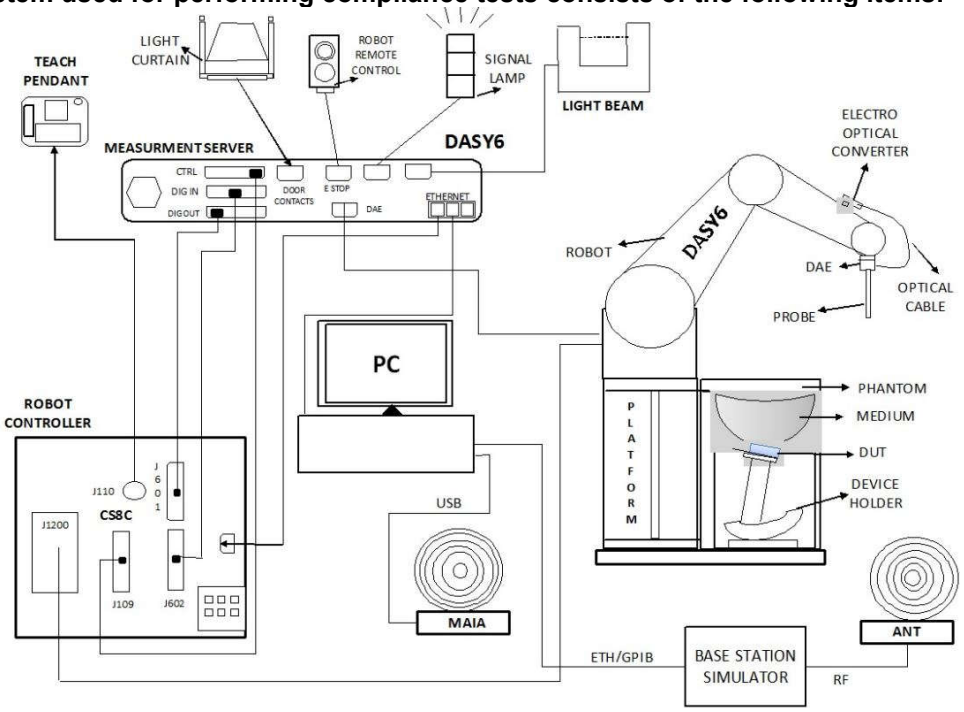
SAR is expressed in units of Watts per kilogram (W/kg)

$$\mathbf{SAR} = \frac{\boldsymbol{\sigma}|\mathbf{E}|^2}{\boldsymbol{\rho}}$$

Where: σ is the conductivity of the tissue, ρ is the mass density of the tissue and E is the RMS electrical field strength.

7. System Description and Setup

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



- A standard high precision 6-axis robot 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 amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The Electro-optical converter (EOC) performs the conversion 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 or Win10 and the DASY5 or DASY6 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.

7.1 E-Field Probe

The SAR measurement is conducted with the dosimetric probe (manufactured by SPEAG).The probe is specially designed and calibrated for use in liquid with high permittivity. The dosimetric probe has special calibration in liquid at different frequency. This probe has a built in optical surface detection system to prevent from collision with phantom.

<EX3DV4 Probe>

Construction	Symmetric design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Frequency	10 MHz – >6 GHz Linearity: ±0.2 dB (30 MHz – 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 – >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

7.2 Data Acquisition Electronics (DAE)

The data acquisition electronics (DAE) consists 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 and 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 input impedance of the DAE is 200 MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.

Fig 5.1 Photo of DAE

7.3 Phantom

<SAM Twin Phantom>

Shell Thickness	2 ± 0.2 mm; Center ear point: 6 ± 0.2 mm
Filling Volume	Approx. 25 liters
Dimensions	Length: 1000 mm; Width: 500 mm; Height: adjustable feet
Measurement Areas	Left Hand, Right Hand, Flat Phantom

The bottom plate contains three pair of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections. A white cover is provided to tap the phantom during off-periods to prevent water evaporation and changes in the liquid parameters. On the phantom top, three reference markers are provided to identify the phantom position with respect to the robot.

<ELI Phantom>

Shell Thickness	2 ± 0.2 mm (sagging: <1%)
Filling Volume	Approx. 30 liters
Dimensions	Major ellipse axis: 600 mm Minor axis: 400 mm

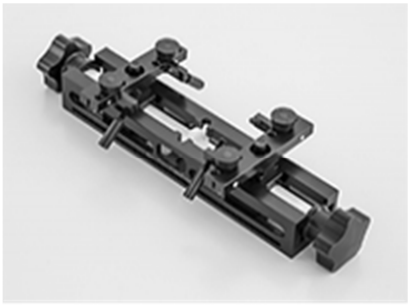
The ELI phantom is intended for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI4 is fully compatible with standard and all known tissue simulating liquids.

7.4 Device Holder

<Mounting Device for Hand-Held Transmitter>

In combination with the Twin SAM V5.0/V5.0c or ELI phantoms, the Mounting Device for Hand-Held Transmitters enables rotation of the mounted transmitter device to specified spherical coordinates. At the heads, the rotation axis is at the ear opening. Transmitter devices can be easily and accurately positioned according to IEC 62209-1, IEEE 1528, FCC, or other specifications. The device holder can be locked for positioning at different phantom sections (left head, right head, flat). And upgrade kit to Mounting Device to enable easy mounting of wider devices like big smart-phones, e-books, small tablets, etc. It holds devices with width up to 140 mm.

Mounting Device for Hand-Held Transmitters



Mounting Device Adaptor for Wide-Phones

<Mounting Device for Laptops and other Body-Worn Transmitters>

The extension is lightweight and made of POM, acrylic glass and foam. It fits easily on the upper part of the mounting device in place of the phone positioned. The extension is fully compatible with the SAM Twin and ELI phantoms.

Mounting Device for Laptops

8. Measurement Procedures

The measurement procedures are as follows:

<Conducted power measurement>

(a) For WWAN power measurement, use base station simulator to configure EUT WWAN transmission in conducted 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 WLAN/BT power measurement, use engineering software to configure EUT WLAN/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 WLAN/BT output power

<SAR measurement>

(a) Use base station simulator to configure EUT WWAN transmission in radiated connection, and engineering software to configure EUT WLAN/BT continuously transmission, at maximum RF power, in the highest power channel.
(b) Place the EUT in the positions as Appendix D demonstrates.
(c) Set scan area, grid size and other setting on the DASY software.
(d) Measure SAR results for the highest power channel on each testing position.
(e) Find out the largest SAR result on these testing positions of each band
(f) Measure SAR results for other channels in worst SAR testing position if the reported SAR of highest power channel is larger than 0.8 W/kg

According to the test standard, the recommended procedure for assessing the peak spatial-average SAR value consists of the following steps:

(a) Power reference measurement
(b) Area scan
(c) Zoom scan
(d) Power drift measurement

8.1 Spatial Peak SAR Evaluation

The procedure for spatial peak SAR evaluation has been implemented according to the test standard. It can be conducted for 1g and 10g, as well as for user-specific masses. The DASY software includes all numerical procedures necessary to evaluate the spatial peak SAR value.

The base for the evaluation is a "cube" measurement. The measured volume must include the 1g and 10g cubes with the highest averaged SAR values. For that purpose, the center of the measured volume is aligned to the interpolated peak SAR value of a previously performed area scan.

The entire evaluation of the spatial peak values is performed within the post-processing engine (SEMCAD). The system always gives the maximum values for the 1g and 10g cubes. The algorithm to find the cube with highest averaged SAR is divided into the following stages:

(a) Extraction of the measured data (grid and values) from the Zoom Scan
(b) Calculation of the SAR value at every measurement point based on all stored data (A/D values and measurement parameters)
(c) Generation of a high-resolution mesh within the measured volume
(d) Interpolation of all measured values form the measurement grid to the high-resolution grid
(e) Extrapolation of the entire 3-D field distribution to the phantom surface over the distance from sensor to surface
(f) Calculation of the averaged SAR within masses of 1g and 10g

8.2 Power Reference Measurement

The Power Reference Measurement and Power Drift Measurements are for monitoring the power drift of the device under test in the batch process. The minimum distance of probe sensors to surface determines the closest measurement point to phantom surface. This distance cannot be smaller than the distance of sensor calibration points to probe tip as defined in the probe properties.

8.3 Area Scan

The area scan is used as a fast scan in two dimensions to find the area of high field values, before doing a fine measurement around the hot spot. The sophisticated interpolation routines implemented in DASY software can find the maximum found in the scanned area, within a range of the global maximum. The range (in dB0 is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE standard 1528 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan), if only one zoom scan follows the area scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of zoom scans has to be increased accordingly.

Area scan parameters extracted from FCC KDB 865664 D01v01r04 SAR measurement 100 MHz to 6 GHz.

	≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface	5 ± 1 mm	½·δ·ln(2) ± 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.	

8.4 Zoom Scan

Zoom scans are used assess the peak spatial SAR values within a cubic averaging volume containing 1 gram and 10 gram of simulated tissue. The zoom scan measures points (refer to table below) within a cube shoes base faces are centered on the maxima found in a preceding area scan job within the same procedure. When the measurement is done, the zoom scan evaluates the averaged SAR for 1 gram and 10 gram and displays these values next to the job's label.

Zoom scan parameters extracted from FCC KDB 865664 D01v01r04 SAR measurement 100 MHz to 6 GHz.

			≤ 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	≤ 1.5·$\Delta z_{Zoom}(n-1)$	
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 draft standard IEEE P1528-2011 for details.

* When zoom scan is required and the *reported* SAR from the *area scan based 1-g SAR estimation* procedures of KDB 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.

8.5 Volume Scan Procedures

The volume scan is used for assess overlapping SAR distributions for antennas transmitting in different frequency bands. It is equivalent to an oversized zoom scan used in standalone measurements. The measurement volume will be used to enclose all the simultaneous transmitting antennas. For antennas transmitting simultaneously in different frequency bands, the volume scan is measured separately in each frequency band. In order to sum correctly to compute the 1g aggregate SAR, the EUT remain in the same test position for all measurements and all volume scan use the same spatial resolution and grid spacing. When all volume scan were completed, the software, SEMCAD postprocessor can combine and subsequently superpose these measurement data to calculating the multiband SAR.

8.6 Power Drift Monitoring

All SAR testing is under the EUT install full charged battery and transmit maximum output power. In DASY measurement software, the power reference measurement and power drift measurement procedures are used for monitoring the power drift of EUT during SAR test. Both these procedures measure the field at a specified reference position before and after the SAR testing. The software will calculate the field difference in dB. If the power drifts more than 5%, the SAR will be retested.

9. Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
SPEAG	750MHz System Validation Kit	D750V3	1087	2022/2/24	2023/2/23
SPEAG	835MHz System Validation Kit	D835V2	4d162	2021/12/17	2022/12/16
SPEAG	1750MHz System Validation Kit	D1750V2	1090	2022/2/24	2023/2/23
SPEAG	1900MHz System Validation Kit	D1900V2	5d182	2021/12/20	2022/12/19
SPEAG	2450MHz System Validation Kit	D2450V2	924	2020/9/2	2023/9/1
SPEAG	2600MHz System Validation Kit	D2600V2	1061	2020/11/26	2023/11/25
SPEAG	5000MHz System Validation Kit	D5GHzV2	1113	2019/9/24	2022/9/22
SPEAG	Data Acquisition Electronics	DAE4	1649	2022/3/30	2023/3/29
SPEAG	Dosimetric E-Field Probe	EX3DV4	3887	2021/10/22	2022/10/21
SPEAG	ELI4 Phantom	ELI 5.0	TP-2151	NCR	NCR
SPEAG	Phone Positioner	N/A	N/A	NCR	NCR
Anritsu	Radio Communication Analyzer	MT8821C	6262306173	2021/7/15	2022/7/14
Agilent	ENA Series Network Analyzer	E5071C	MY46106933	2021/7/31	2022/7/30
SPEAG	Dielectric Probe Kit	DAK-3.5	1071	2022/1/24	2023/1/23
Anritsu	Vector Signal Generator	MG3710A	6201682672	2022/1/6	2023/1/5
Rohde & Schwarz	Power Meter	NRVD	102081	2021/8/12	2022/8/11
Rohde & Schwarz	Power Sensor	NRV-Z5	100538	2021/8/12	2022/8/11
Rohde & Schwarz	Power Sensor	NRV-Z5	100539	2021/8/12	2022/8/11
R&S	CBT BLUETOOTH TESTER	CBT	100641	2022/1/5	2023/1/4
EXA	Spectrum Analyzer	FSV7	101631	2021/10/14	2022/10/13
Testo	Thermo-Hygrometer	608-H1	1241332126	2022/1/6	2023/1/5
FLUKE	DIGITAC THERMOMETER	51II	97240029	2021/10/23	2022/10/22
BONN	POWER AMPLIFIER	BLMA 0830-3	087193A	Note 1	
BONN	POWER AMPLIFIER	BLMA 2060-2	087193B	Note 1	
ARRA	Power Divider	A3200-2	N/A	Note 1	
MCL	Attenuation1	BW-S10W5+	N/A	Note 1	
MCL	Attenuation2	BW-S10W5+	N/A	Note 1	
MCL	Attenuation3	BW-S10W5+	N/A	Note 1	
Agilent	Dual Directional Coupler	778D	20500	Note 1	
Agilent	Dual Directional Coupler	11691D	MY48151020	Note 1	

Note:

1. Prior to system verification and validation, the path loss from the signal generator to the system check source and the power meter, which includes the amplifier, cable, attenuator and directional coupler, was measured by the network analyzer. The reading of the power meter was offset by the path loss difference between the path to the power meter and the path to the system check source to monitor the actual power level fed to the system check source.
2. Referring to KDB 865664 D01v01r04, the dipole calibration interval can be extended to 3 years with justification. The dipoles are also not physically damaged, or repaired during the interval.
3. The justification data of dipole can be found in appendix C. The return loss is < -20dB, within 20% of prior calibration, the impedance is within 5 ohm of prior calibration.

10. System Verification

10.1 Tissue Simulating Liquids

For the measurement of the field distribution inside the SAM phantom with DASY, the phantom must be filled with around 25 liters of homogeneous body tissue simulating liquid. For body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15 cm, which is shown in Fig. 11.1.

Fig 11.1 Photo of Liquid Height for Body SAR

10.2 Tissue Verification

The following tissue formulations are provided for reference only as some of the parameters have not been thoroughly verified. The composition of ingredients may be modified accordingly to achieve the desired target tissue parameters required for routine SAR evaluation.

Frequency (MHz)	Water (%)	Sugar (%)	Cellulose (%)	Salt (%)	Preventol (%)	DGBE (%)	Conductivity (σ)	Permittivity (εr)
For Head								
750	41.1	57.0	0.2	1.4	0.2	0	0.89	41.9
835	40.3	57.9	0.2	1.4	0.2	0	0.90	41.5
1800, 1900, 2000	55.2	0	0	0.3	0	44.5	1.40	40.0
2450	55.0	0	0	0	0	45.0	1.80	39.2
2600	54.8	0	0	0.1	0	45.1	1.96	39.0

Simulating Liquid for 5GHz, Manufactured by SPEAG

Ingredients	(% by weight)
Water	64~78%
Mineral oil	11~18%
Emulsifiers	9~15%
Additives and Salt	2~3%

<Tissue Dielectric Parameter Check Results>

Frequency (MHz)	Tissue Type	Liquid Temp. (℃)	Conductivity (σ)	Permittivity (ε_r)	Conductivity Target (σ)	Permittivity Target (ε_r)	Delta (σ) (%)	Delta (ε_r) (%)	Limit (%)	Date
750	Head	22.7	0.902	41.600	0.89	41.90	1.35	-0.72	±5	2022/6/1
835	Head	22.8	0.929	40.900	0.90	41.50	3.22	-1.45	±5	2022/6/2
1750	Head	22.9	1.390	40.500	1.37	40.10	1.46	1.00	±5	2022/6/4
1900	Head	22.7	1.450	40.300	1.40	40.00	3.57	0.75	±5	2022/6/5
2450	Head	22.5	1.820	39.200	1.80	39.20	1.11	0.00	±5	2022/6/7
2600	Head	22.5	1.930	38.200	1.96	39.00	-1.53	-2.05	±5	2022/6/8
5250	Head	22.8	4.570	36.000	4.71	35.90	-2.97	0.28	±5	2022/6/9
5600	Head	22.6	4.970	35.400	5.07	35.50	-1.97	-0.28	±5	2022/6/10
5750	Head	22.7	5.140	35.200	5.22	35.40	-1.53	-0.56	±5	2022/6/11

10.3 System Performance Check Results

Comparing to the original SAR value provided by SPEAG, the verification data should be within its specification of 10 %. Below table shows the target SAR and measured SAR after normalized to 1W input power. The table below indicates the system performance check can meet the variation criterion and the plots can be referred to Appendix A of this report.

Date	Frequency (MHz)	Tissue Type	Input Power (mW)	Dipole S/N	Probe S/N	DAE S/N	Measured 1g SAR (W/kg)	Targeted 1g SAR (W/kg)	Normalized 1g SAR (W/kg)	Deviation (%)
2022/6/1	750	Head	50	1087	3887	1649	0.409	8.58	8.18	-4.66
2022/6/2	835	Head	50	4d162	3887	1649	0.479	9.64	9.58	-0.62
2022/6/4	1750	Head	50	1090	3887	1649	1.840	37.00	36.8	-0.54
2022/6/5	1900	Head	50	5d182	3887	1649	1.950	39.60	39	-1.52
2022/6/7	2450	Head	50	924	3887	1649	2.450	51.40	49	-4.67
2022/6/8	2600	Head	50	1061	3887	1649	2.630	56.60	52.6	-7.07
2022/6/9	5250	Head	50	1113	3887	1649	3.720	80.50	74.4	-7.58
2022/6/10	5600	Head	50	1113	3887	1649	4.140	83.40	82.8	-0.72
2022/6/11	5750	Head	50	1113	3887	1649	3.740	80.00	74.8	-6.50

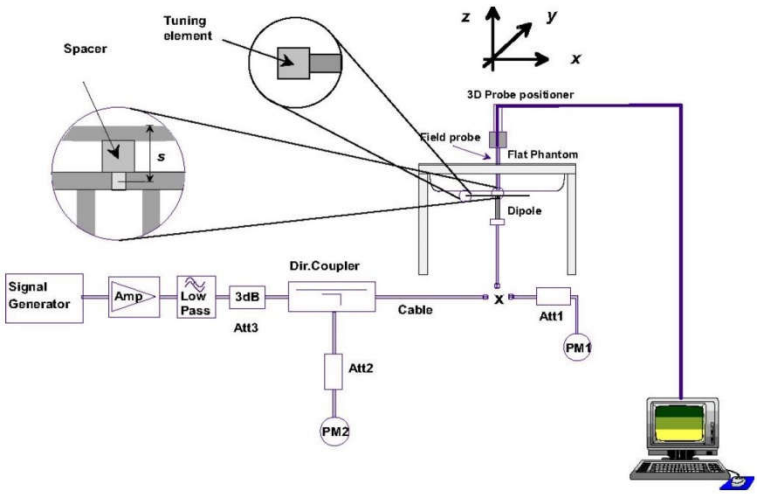


Fig 8.3.1 System Performance Check Setup

Fig 8.3.2 Setup Photo

11. RF Exposure Positions

11.1 SAR Testing for Tablet

This device can be used also in full sized tablet exposure conditions, due to its size. Per FCC KDB 616217, the back surface and edges of the tablet should be tested for SAR compliance with the tablet touching the phantom. The SAR exclusion threshold in KDB 447498 D01v06 can be applied to determine SAR test exclusion for adjacent edge configurations. The closest distance from the antenna to an adjacent tablet edge is used to determine if SAR testing is required for the adjacent edges, with the adjacent edge positioned against the phantom and the edge containing the antenna positioned perpendicular to the phantom.

<EUT Setup Photos>

Please refer to Appendix D for the test setup photos.

12. SAR Test Results

12.1 Body SAR

<GSM SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Power Reduction	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
01	GSM850	GPRS 2 Tx slots	Bottom Face	0mm	Full Power	251	848.8	30.26	30.50	1.057	-0.04	0.972	**1.027**

<FDD LTE SAR>

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (mm)	Power Reduction	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
02	LTE Band 25	20M	QPSK	1	0	Bottom Face	0mm	Full Power	26140	1860	23.13	24.00	1.222	-0.05	0.921	**1.125**
03	LTE Band 4	20M	QPSK	1	0	Bottom Face	0mm	Full Power	20175	1732.5	23.98	24.00	1.005	-0.15	0.973	**0.977**

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (mm)	Power Reduction	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
04	LTE Band 12	10M	QPSK	1	0	Bottom Face	0mm	Full Power	23095	707.5	23.40	24.00	1.148	0.07	0.984	**1.130**

<TDD LTE SAR>

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (mm)	Power Reduction	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
05	LTE Band 41	20M	QPSK	1	0	Bottom Face	0mm	Full Power	41490	2680	22.93	24.00	1.279	62.9	1.006	-0.06	0.678	**0.873**

<Bluetooth SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Antenna	Power Reduction	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
06	Bluetooth	1Mbps	Edge 4	0mm	Ant 1	Full Power	78	2480	5.75	7.00	1.334	77.26	1.078	-0.05	0.017	**0.024**

<WLAN 2.4GHz SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Antenna	Power Reduction	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
07	WLAN2.4GHz	802.11b 1Mbps	Edge 1	0mm	Ant 2	Full Power	1	2412	15.26	15.50	1.057	100	1.000	0.07	0.635	**0.671**
	WLAN2.4GHz	802.11b 1Mbps	Edge 4	0mm	Ant 1	Full Power	1	2412	15.36	15.50	1.033	100	1.000	-0.02	0.297	0.307

<WLAN5G SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Antenna	Power Reduction	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	WLAN5.3GHz	802.11n-HT40 MCS0	Edge 1	0mm	Ant 2	Full Power	54	5270	12.55	13.00	1.109	91.61	1.092	0.06	0.697	0.844
	WLAN5.3GHz	802.11n-HT40 MCS0	Edge 1	0mm	Ant 2	Full Power	62	5310	5.86	6.00	1.033	91.61	1.092	0.08	0.152	0.171
08	WLAN5.3GHz	802.11n-HT40 MCS0	Edge 4	0mm	Ant 1	Full Power	54	5270	12.68	13.00	1.076	92.91	1.076	0.13	1.130	**1.309**
	WLAN5.3GHz	802.11n-HT40 MCS0	Edge 4	0mm	Ant 1	Full Power	62	5310	5.80	6.00	1.047	92.91	1.076	-0.04	0.239	0.269
	WLAN5.3GHz	802.11a 6Mbps	Edge 4	0mm	Ant 1	Full Power	52	5260	11.93	13.00	1.279	92.91	1.076	0.03	0.868	1.195
	WLAN5.2GHz	802.11n-HT40 MCS0	Edge 4	0mm	Ant 1	Full Power	46	5230	12.96	13.00	1.009	92.91	1.076	0.03	0.982	1.066
	WLAN5.5GHz	802.11n-HT40 MCS0	Edge 1	0mm	Ant 2	Full Power	134	5670	9.96	11.50	1.426	91.61	1.092	0.08	0.530	0.825
	WLAN5.5GHz	802.11n-HT40 MCS0	Edge 1	0mm	Ant 2	Full Power	110	5550	10.10	11.50	1.380	91.61	1.092	0.02	0.561	0.846
	WLAN5.5GHz	802.11n-HT40 MCS0	Edge 1	0mm	Ant 2	Full Power	126	5630	10.00	11.50	1.413	91.61	1.092	0.03	0.522	0.805
09	WLAN5.5GHz	802.11n-HT40 MCS0	Edge 4	0mm	Ant 1	Full Power	110	5550	10.30	11.50	1.318	92.91	1.076	0.01	0.916	**1.299**
	WLAN5.5GHz	802.11n-HT40 MCS0	Edge 4	0mm	Ant 1	Full Power	126	5630	10.35	11.50	1.303	92.91	1.076	0.05	0.827	1.160
	WLAN5.5GHz	802.11n-HT40 MCS0	Edge 4	0mm	Ant 1	Full Power	142	5710	10.34	11.50	1.306	92.91	1.076	-0.08	0.729	1.025
	WLAN5.5GHz	802.11a 6Mbps	Edge 4	0mm	Ant 1	Full Power	126	5630	10.97	11.50	1.130	92.91	1.076	0.11	0.912	1.109
	WLAN5.8GHz	802.11n-HT40 MCS0	Edge 1	0mm	Ant 2	Full Power	159	5795	12.76	13.00	1.057	91.61	1.092	0.06	0.691	0.797
10	WLAN5.8GHz	802.11n-HT40 MCS0	Edge 4	0mm	Ant 1	Full Power	159	5795	11.83	13.00	1.309	92.91	1.076	0.03	0.862	**1.214**

Note: The verified maximum SAR from chapter 12.1 to 12.4 are most less than original report, although some band a little higher than original application, they are all in measurement uncertainty, so no need to consider co-located SAR for original report has been performed conservatively.

12.2 Repeated SAR Measurement

No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Mode	Test Position	Gap (mm)	Antenna	Power Reduction	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Ratio	Reported 1g SAR (W/kg)
1st	GSM850	-	-	-	-	GPRS 2 Tx slots	Bottom Face	0mm	-	Full	251	848.8	30.26	30.50	1.057	-	-	-0.04	0.972	1	1.027
2nd	GSM850	-	-	-	-	GPRS 2 Tx slots	Bottom Face	0mm	-	Full	251	848.8	30.26	30.50	1.057	-	-	0.11	0.912	1.066	0.964
1st	LTE Band 25	20M	QPSK	1	0	-	Bottom Face	0mm	-	Full	26140	1860	23.13	24.00	1.222	-	-	-0.05	0.921	1	1.125
2nd	LTE Band 25	20M	QPSK	1	0	-	Bottom Face	0mm	-	Full	26140	1860	23.13	24.00	1.222	-	-	0.09	0.886	1.040	1.083
1st	LTE Band 4	20M	QPSK	1	0	-	Bottom Face	0	-	Full	20175	1732.5	23.98	24.00	1.005	-	-	-0.15	0.973	1	0.977
2nd	LTE Band 4	20M	QPSK	1	0	-	Bottom Face	0	-	Full	20175	1732.5	23.98	24.00	1.005	-	-	0.13	0.922	1.055	0.926
1st	LTE Band 12	10M	QPSK	1	0	-	Bottom Face	0mm	-	Full	23095	707.5	23.40	24.00	1.148	-	-	0.07	0.984	1	1.130
2nd	LTE Band 12	10M	QPSK	1	0	-	Bottom Face	0mm	-	Full	23095	707.5	23.40	24.00	1.148	-	-	0.07	0.966	1.019	1.109
1st	WLAN5.2GHz	-	-	-	-	802.11n-HT40 MCS0	Edge 4	0mm	Ant 1	Full	46	5230	12.96	13.00	1.009	92.91	1.076	0.03	0.982	1	1.066
2nd	WLAN5.2GHz	-	-	-	-	802.11n-HT40 MCS0	Edge 4	0mm	Ant 1	Full	46	5230	12.96	13.00	1.009	92.91	1.076	0.11	0.955	1.028	1.037
1st	WLAN5.3GHz	-	-	-	-	802.11n-HT40 MCS0	Edge 4	0mm	Ant 1	Full	54	5270	12.68	13.00	1.076	92.91	1.076	0.13	1.130	1	1.309
2nd	WLAN5.3GHz	-	-	-	-	802.11n-HT40 MCS0	Edge 4	0mm	Ant 1	Full	54	5270	12.68	13.00	1.076	92.91	1.076	0.05	1.031	1.096	1.194
1st	WLAN5.5GHz	-	-	-	-	802.11n-HT40 MCS0	Edge 4	0mm	Ant 1	Full	110	5550	10.30	11.50	1.318	92.91	1.076	0.01	0.916	1	1.299
2nd	WLAN5.5GHz	-	-	-	-	802.11n-HT40 MCS0	Edge 4	0mm	Ant 1	Full	110	5550	10.30	11.50	1.318	92.91	1.076	0.03	0.839	1.092	1.190
1st	WLAN5.8GHz	-	-	-	-	802.11n-HT40 MCS0	Edge 4	0mm	Ant 1	Full	159	5795	11.83	13.00	1.309	92.91	1.076	0.03	0.862	1	1.214
2nd	WLAN5.8GHz	-	-	-	-	802.11n-HT40 MCS0	Edge 4	0mm	Ant 1	Full	159	5795	11.83	13.00	1.309	92.91	1.076	0.03	0.811	1.063	1.142

General Note:

1. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥0.8W/kg.
2. Per KDB 865664 D01v01r04, if the ratio among the repeated measurement is ≤ 1.2 and the measured SAR <1.45W/kg, only one repeated measurement is required.
3. The ratio is the difference in percentage between original and repeated *measured SAR*.
4. All measurement SAR result is scaled-up to account for tune-up tolerance and is compliant.

Test Engineer : Martin Li, Varus Wang, Ricky Gu, Light Wang, Damon Zhu

13. Uncertainty Assessment

Per KDB 865664 D01 SAR measurement 100MHz to 6GHz, when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg and the measured 10-g SAR within a frequency band is < 3.75 W/kg. The expanded SAR measurement uncertainty must be ≤ 30%, for a confidence interval of k = 2. If these conditions are met, extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2013 is not required in SAR reports submitted for equipment approval. For this device, the highest measured 1-g SAR is less 1.5W/kg. Therefore, the measurement uncertainty table is not required in this report.

14. References

[1] FCC 47 CFR Part 2 “Frequency Allocations and Radio Treaty Matters; General Rules and Regulations”

[2] ANSI/IEEE Std. C95.1-1992, “IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz”, September 1992

[3] 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”, Sep 2013

[4] SPEAG DASY System Handbook

[5] FCC KDB 865664 D01 v01r04, "SAR Measurement Requirements for 100 MHz to 6 GHz", Aug 2015.

[6] FCC KDB 865664 D02 v01r02, “RF Exposure Compliance Reporting and Documentation Considerations” Oct 2015.

[7] FCC KDB 447498 D01 v06, “Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies”, Oct 2015

[8] FCC KDB 248227 D01 v02r02, “SAR Guidance for IEEE 802.11 (WiFi) Transmitters”, Oct 2015.

[9] FCC KDB 616217 D04 v01r02, “SAR Evaluation Considerations for Laptop, Notebook, Netbook and Tablet Computers”, Oct 2015

[10] FCC KDB 941225 D01 v03r01, “3G SAR MEAUREMENT PROCEDURES”, Oct 2015

[11] FCC KDB 941225 D05 v02r05, “SAR Evaluation Considerations for LTE Devices”, Dec 2015

[12] FCC KDB 941225 D05A v01r02, “Rel. 10 LTE SAR Test Guidance and KDB Inquiries”, Oct 2015

Appendix A. Plots of System Performance Check

The plots are shown as follows.

Date: 2022-06-01

System Check_Head_750MHz

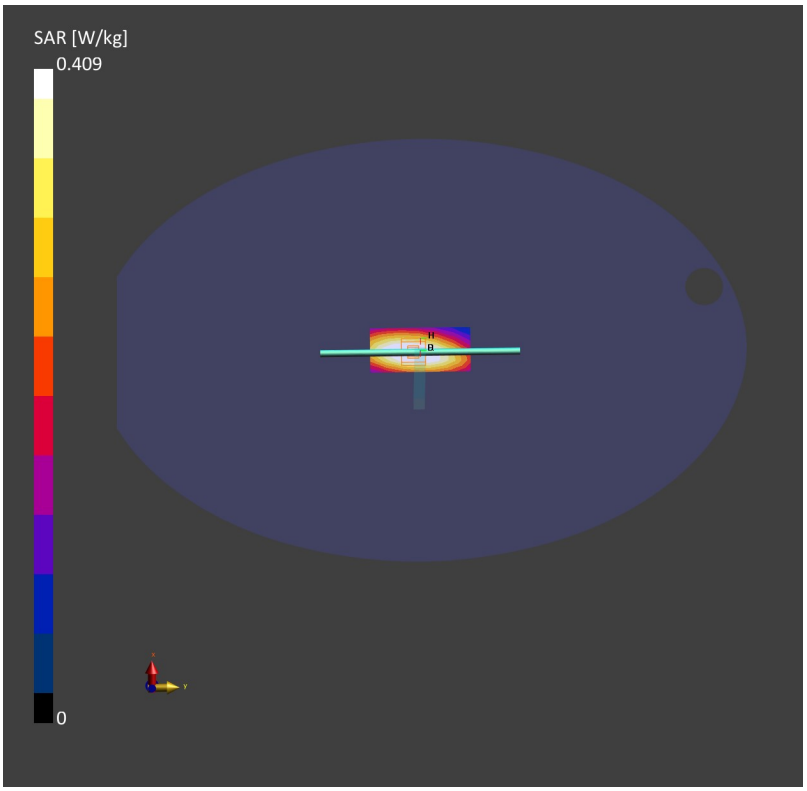
DUT: 750V3-SN:1087

Communication System: ; Frequency: 750.0
Medium: HSL. Medium parameters used: f= 750.0 MHz; σ= 0.902 S/m; ε_r = 41.6
Ambient Temperature: 23.1°C; Liquid Temperature: 22.7°C

DASY6 Configuration:
- Probe: EX3DV4 - SN3887; ConvF(9.58, 9.58, 9.58); Calibrated: 2021-10-22
- Sensor-Surface: 1.4 mm
- Electronics: DAE4 Sn1649; Calibrated: 2022-03-30
- Phantom: ELI V8.0 (20deg probe tilt); Serial: 2151; Section: Flat
- Measurement Software: cDASY6 V6.6.0.13926

Area Scan (40.0 mm x 90.0 mm): Measurement Grid: 15.0 mm x 15.0 mm
SAR (1g) = 0.410 W/kg; SAR (10g) = 0.275 W/kg;

Zoom Scan (32.0 mm x 32.0 mm x 30.0 mm): Measurement Grid: 8.0 mm x 8.0 mm x 5.0 mm
Power Drift = 0.01 dB
SAR (1g) = 0.409 W/kg; SAR (10g) = 0.267 W/kg;



Date: 2022-06-02

System Check_Head_835MHz

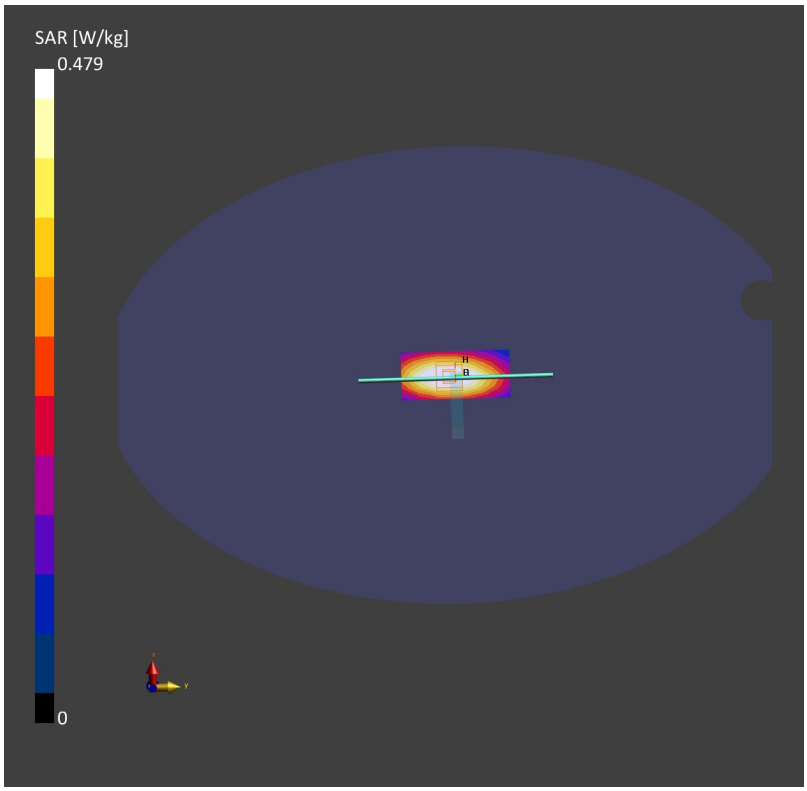
DUT: 835V2-SN:4d162

Communication System: ; Frequency: 835.0
Medium: HSL. Medium parameters used: f= 835.0 MHz; σ= 0.929 S/m; ε_r = 40.9
Ambient Temperature: 23.2°C; Liquid Temperature: 22.8°C

DASY6 Configuration:
- Probe: EX3DV4 - SN3887; ConvF(9.38, 9.38, 9.38); Calibrated: 2021-10-22
- Sensor-Surface: 1.4 mm
- Electronics: DAE4 Sn1649; Calibrated: 2022-03-30
- Phantom: ELI V8.0 (20deg probe tilt); Serial: 2151; Section: Flat
- Measurement Software: cDASY6 V6.6.0.13926

Area Scan (40.0 mm x 90.0 mm): Measurement Grid: 15.0 mm x 15.0 mm
SAR (1g) = 0.479 W/kg; SAR (10g) = 0.316 W/kg;

Zoom Scan (32.0 mm x 32.0 mm x 30.0 mm): Measurement Grid: 8.0 mm x 8.0 mm x 5.0 mm
Power Drift = 0.01 dB
SAR (1g) = 0.479 W/kg; SAR (10g) = 0.314 W/kg;



Date: 2022-06-04

System Check_Head_1750MHz

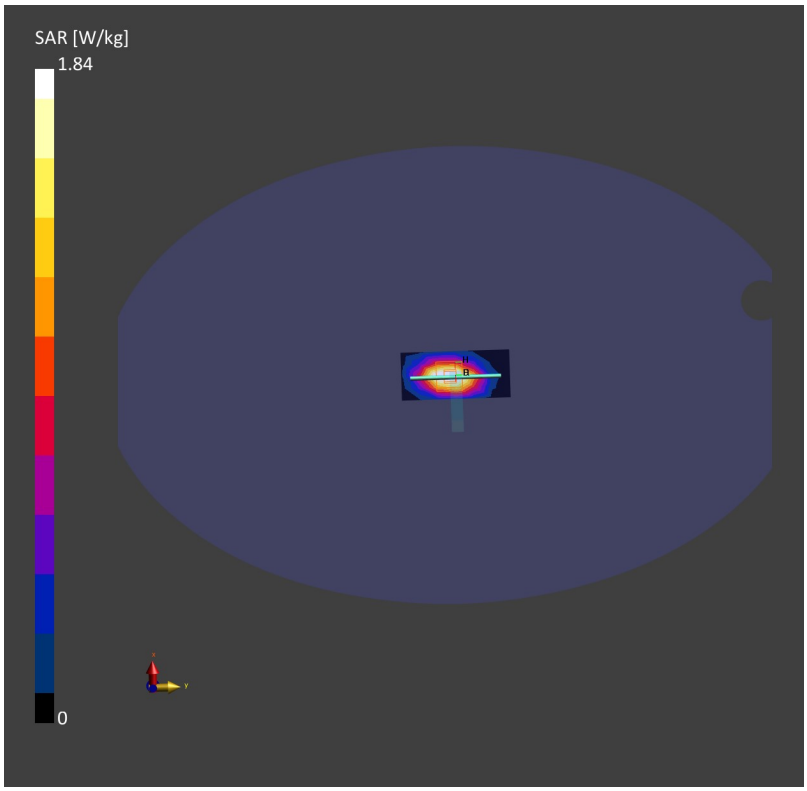
DUT: D1750V2-SN:1090

Communication System: ; Frequency: 1750.0
Medium: HSL. Medium parameters used: f= 1750.0 MHz; σ= 1.39 S/m; ε_r = 40.5
Ambient Temperature: 23.2°C; Liquid Temperature: 22.9°C

DASY6 Configuration:
- Probe: EX3DV4 - SN3887; ConvF(8.42, 8.42, 8.42); Calibrated: 2021-10-22
- Sensor-Surface: 1.4 mm
- Electronics: DAE4 Sn1649; Calibrated: 2022-03-30
- Phantom: ELI V8.0 (20deg probe tilt); Serial: 2151; Section: Flat
- Measurement Software: cDASY6 V6.6.0.13926

Area Scan (40.0 mm x 90.0 mm): Measurement Grid: 15.0 mm x 15.0 mm
SAR (1g) = 1.81 W/kg; SAR (10g) = 0.974 W/kg;

Zoom Scan (32.0 mm x 32.0 mm x 30.0 mm): Measurement Grid: 8.0 mm x 8.0 mm x 5.0 mm
Power Drift = -0.04 dB
SAR (1g) = 1.84 W/kg; SAR (10g) = 0.978 W/kg;



Date: 2022-06-05

System Check_Head_1900MHz

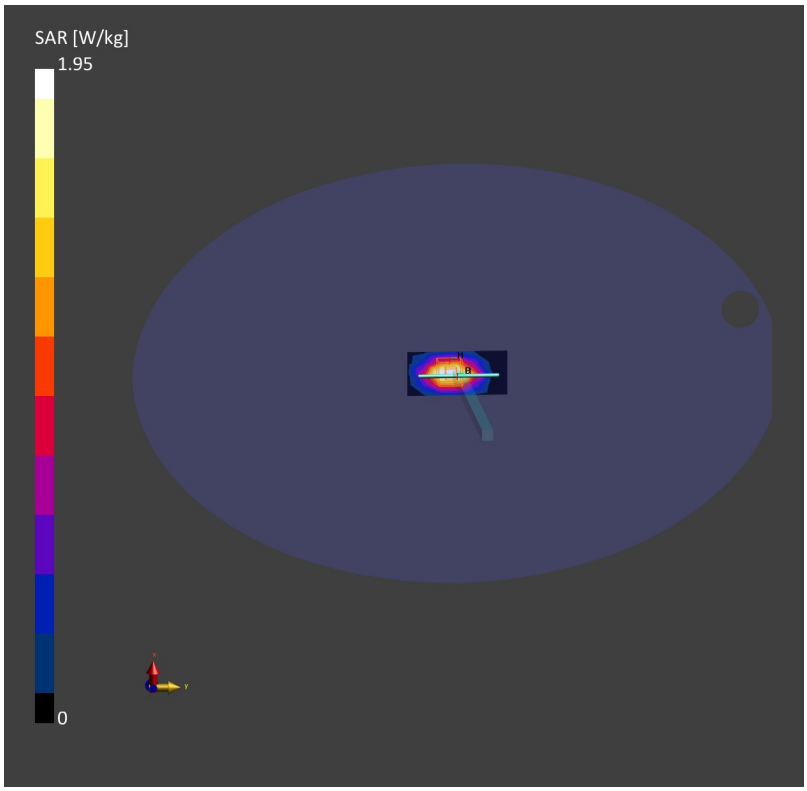
DUT: D1900V2-SN:5d182

Communication System: ; Frequency: 1900.0
Medium: HSL. Medium parameters used: f= 1900.0 MHz; σ= 1.45 S/m; ε_r = 40.3
Ambient Temperature: 23.2°C; Liquid Temperature: 22.7°C

DASY6 Configuration:
- Probe: EX3DV4 - SN3887; ConvF(8.20, 8.20, 8.20); Calibrated: 2021-10-22
- Sensor-Surface: 1.4 mm
- Electronics: DAE4 Sn1649; Calibrated: 2022-03-30
- Phantom: ELI V8.0 (20deg probe tilt); Serial: 2151; Section: Flat
- Measurement Software: cDASY6 V6.6.0.13926

Area Scan (40.0 mm x 90.0 mm): Measurement Grid: 15.0 mm x 15.0 mm
SAR (1g) = 1.86 W/kg; SAR (10g) = 0.981 W/kg;

Zoom Scan (32.0 mm x 32.0 mm x 30.0 mm): Measurement Grid: 8.0 mm x 8.0 mm x 5.0 mm
Power Drift = 0.04 dB
SAR (1g) = 1.95 W/kg; SAR (10g) = 0.993 W/kg;



Date: 2022-06-07

System Check_Head_2450MHz

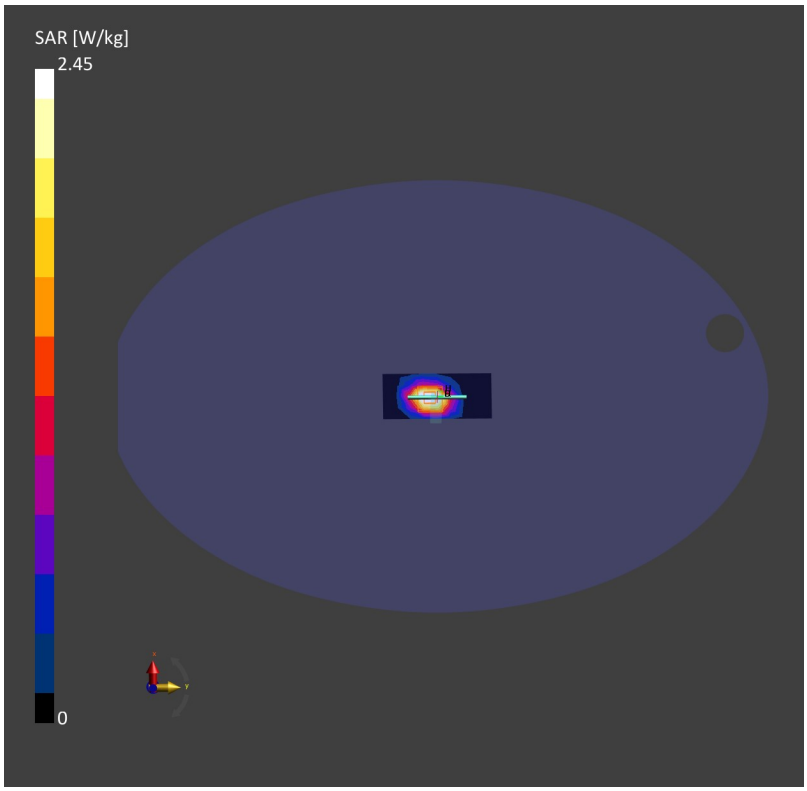
DUT: D2450V2-SN:924

Communication System: ; Frequency: 2450.0
Medium: HSL. Medium parameters used: f= 2450.0 MHz; σ= 1.82 S/m; ε_r = 39.2
Ambient Temperature: 23.2°C; Liquid Temperature: 22.5°C

DASY6 Configuration:
- Probe: EX3DV4 - SN3887; ConvF(7.48, 7.48, 7.48); Calibrated: 2021-10-22
- Sensor-Surface: 1.4 mm
- Electronics: DAE4 Sn1649; Calibrated: 2022-03-30
- Phantom: ELI V8.0 (20deg probe tilt); Serial: 2151; Section: Flat
- Measurement Software: cDASY6 V6.6.0.13926

Area Scan (40.0 mm x 96.0 mm): Measurement Grid: 12.0 mm x 12.0 mm
SAR (1g) = 2.39 W/kg; SAR (10g) = 1.14 W/kg;

Zoom Scan (30.0 mm x 30.0 mm x 30.0 mm): Measurement Grid: 5.0 mm x 5.0 mm x 5.0 mm
Power Drift = -0.01 dB
SAR (1g) = 2.45 W/kg; SAR (10g) = 1.16 W/kg;



Date: 2022-06-08

System Check_Head_2600MHz

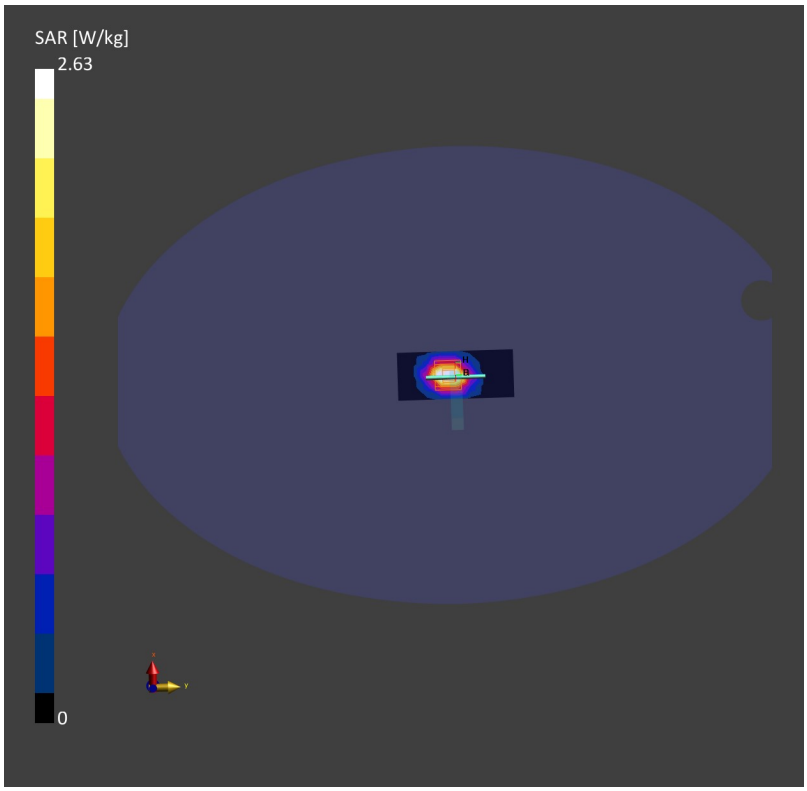
DUT: D2600V2-SN:1061

Communication System: ; Frequency: 2600.0
Medium: HSL. Medium parameters used: f= 2600.0 MHz; σ= 1.93 S/m; ε_r = 38.2
Ambient Temperature: 23.3°C; Liquid Temperature: 22.5°C

DASY6 Configuration:
- Probe: EX3DV4 - SN3887; ConvF(7.24, 7.24, 7.24); Calibrated: 2021-10-22
- Sensor-Surface: 1.4 mm
- Electronics: DAE4 Sn1649; Calibrated: 2022-03-30
- Phantom: ELI V8.0 (20deg probe tilt); Serial: 2151; Section: Flat
- Measurement Software: cDASY6 V6.6.0.13926

Area Scan (40.0 mm x 96.0 mm): Measurement Grid: 12.0 mm x 12.0 mm
SAR (1g) = 2.50 W/kg; SAR (10g) = 1.12 W/kg;

Zoom Scan (30.0 mm x 30.0 mm x 30.0 mm): Measurement Grid: 5.0 mm x 5.0 mm x 5.0mm
Power Drift = -0.02 dB
SAR (1g) = 2.63 W/kg; SAR (10g) = 1.20 W/kg;



Date: 2022-06-09

System Check_Head_5250MHz

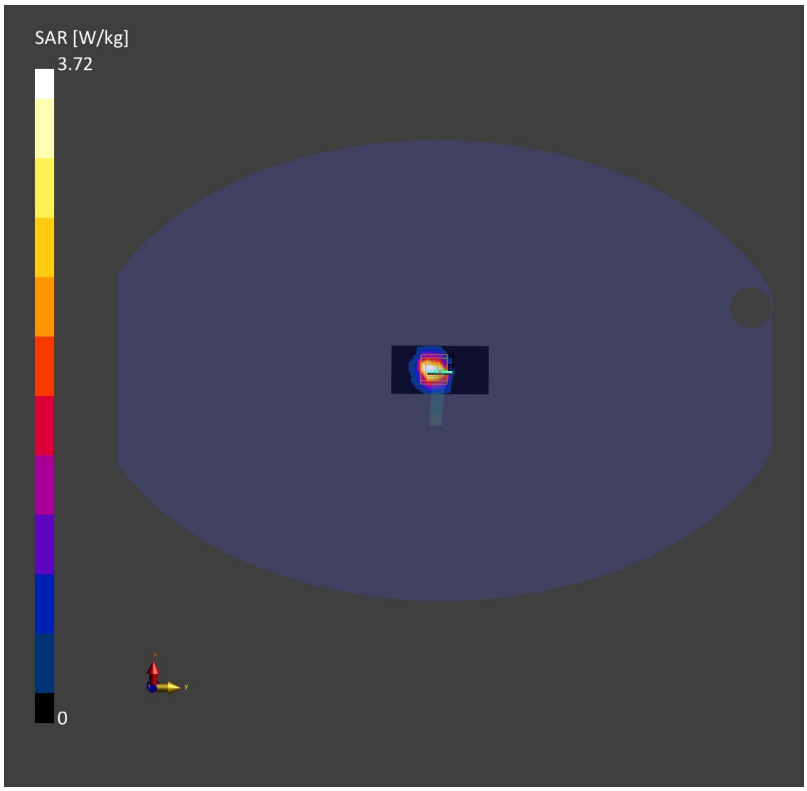
DUT: D5GHzV2-SN:1113

Communication System: ; Frequency: 5250.0
Medium: HSL. Medium parameters used: f= 5250.0 MHz; σ= 4.57 S/m; ε_r = 36.0
Ambient Temperature: 23.2°C; Liquid Temperature: 22.8°C

DASY6 Configuration:
- Probe: EX3DV4 - SN3887; ConvF(4.80, 4.80, 4.80); Calibrated: 2021-10-22
- Sensor-Surface: 1.4 mm
- Electronics: DAE4 Sn1649; Calibrated: 2022-03-30
- Phantom: ELI V8.0 (20deg probe tilt); Serial: 2151; Section: Flat
- Measurement Software: cDASY6 V6.6.0.13926

Area Scan (40.0 mm x 80.0 mm): Measurement Grid: 10.0 mm x 10.0 mm
SAR (1g) = 3.47 W/kg; SAR (10g) = 1.04 W/kg;

Zoom Scan (24.0 mm x 24.0 mm x 22.0 mm): Measurement Grid: 4.0 mm x 4.0 mm x 1.4 mm
Power Drift = 0.01 dB
SAR (1g) = 3.72 W/kg; SAR (10g) = 1.07 W/kg;



Date: 2022-06-10

System Check_Head_5600MHz

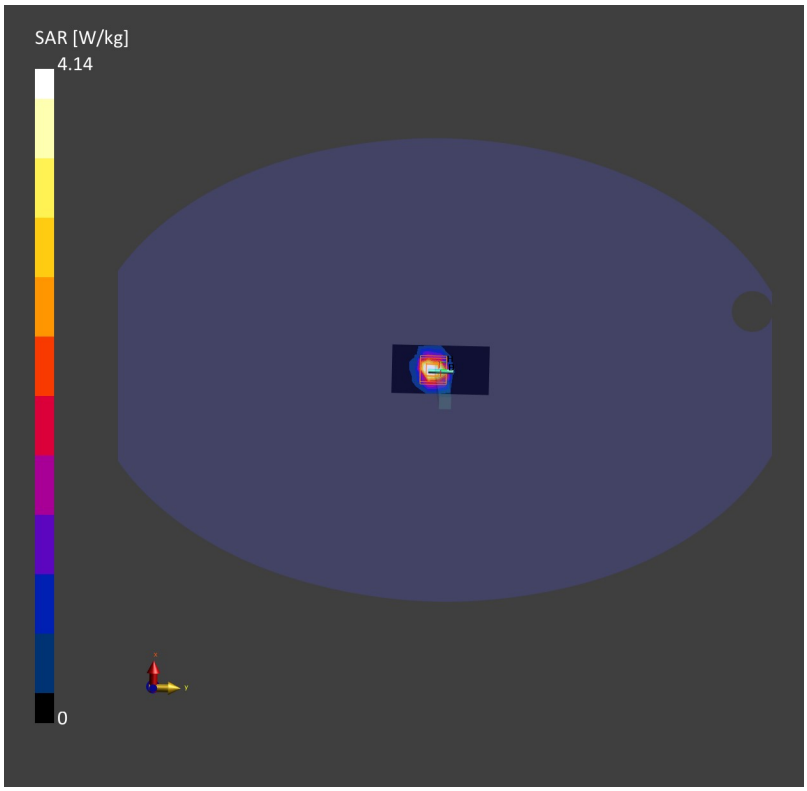
DUT: D5GHzV2-SN:1113

Communication System: ; Frequency: 5600.0
Medium: HSL. Medium parameters used: f= 5600.0 MHz; σ= 4.97 S/m; ε_r = 35.4
Ambient Temperature: 23.1°C; Liquid Temperature: 22.6°C

DASY6 Configuration:
- Probe: EX3DV4 - SN3887; ConvF(4.26, 4.26, 4.26); Calibrated: 2021-10-22
- Sensor-Surface: 1.4 mm
- Electronics: DAE4 Sn1649; Calibrated: 2022-03-30
- Phantom: ELI V8.0 (20deg probe tilt); Serial: 2151; Section: Flat
- Measurement Software: cDASY6 V6.6.0.13926

Area Scan (40.0 mm x 80.0 mm): Measurement Grid: 10.0 mm x 10.0 mm
SAR (1g) = 3.71 W/kg; SAR (10g) = 1.10 W/kg;

Zoom Scan (24.0 mm x 24.0 mm x 22.0 mm): Measurement Grid: 4.0 mm x 4.0 mm x 1.4 mm
Power Drift = -0.01 dB
SAR (1g) = 4.14 W/kg; SAR (10g) = 1.19 W/kg;



Date: 2022-06-11

System Check_Head_5750MHz

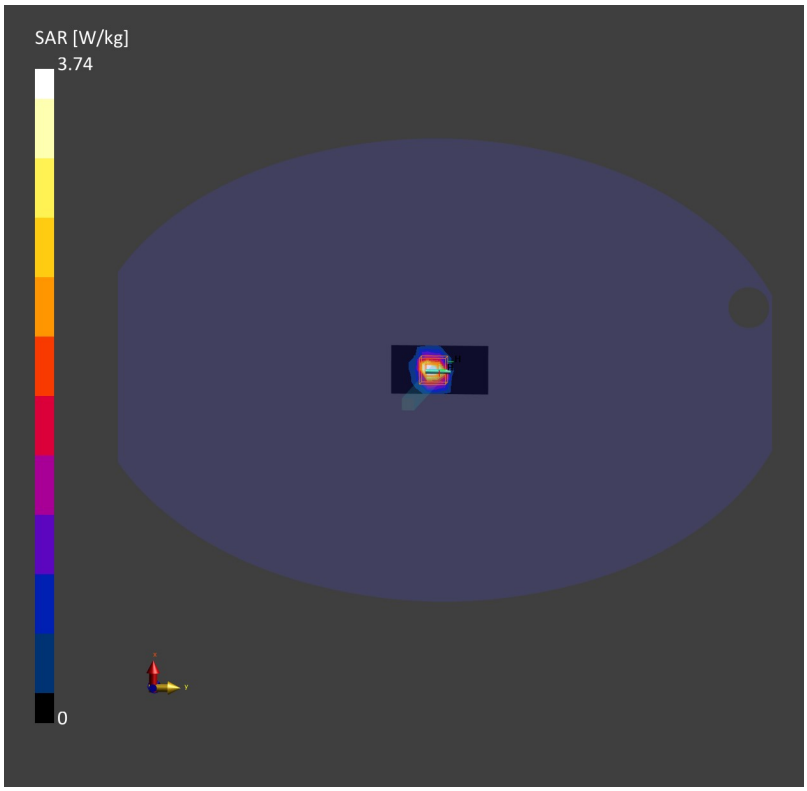
DUT: D5GHzV2-SN:1113

Communication System: ; Frequency: 5750.0
Medium: HSL. Medium parameters used: f= 5750.0 MHz; σ= 5.14 S/m; ε_r = 35.2
Ambient Temperature: 23.1°C; Liquid Temperature: 22.7°C

DASY6 Configuration:
- Probe: EX3DV4 - SN3887; ConvF(4.39, 4.39, 4.39); Calibrated: 2021-10-22
- Sensor-Surface: 1.4 mm
- Electronics: DAE4 Sn1649; Calibrated: 2022-03-30
- Phantom: ELI V8.0 (20deg probe tilt); Serial: 2151; Section: Flat
- Measurement Software: cDASY6 V6.6.0.13926

Area Scan (40.0 mm x 80.0 mm): Measurement Grid: 10.0 mm x 10.0 mm
SAR (1g) = 3.34 W/kg; SAR (10g) = 0.990 W/kg;

Zoom Scan (24.0 mm x 24.0 mm x 22.0 mm): Measurement Grid: 4.0 mm x 4.0 mm x 1.4 mm
Power Drift = 0.01 dB
SAR (1g) = 3.74 W/kg; SAR (10g) = 1.07 W/kg;



Appendix B. Plots of SAR Measurement

The plots are shown as follows.

Date: 2022-06-02

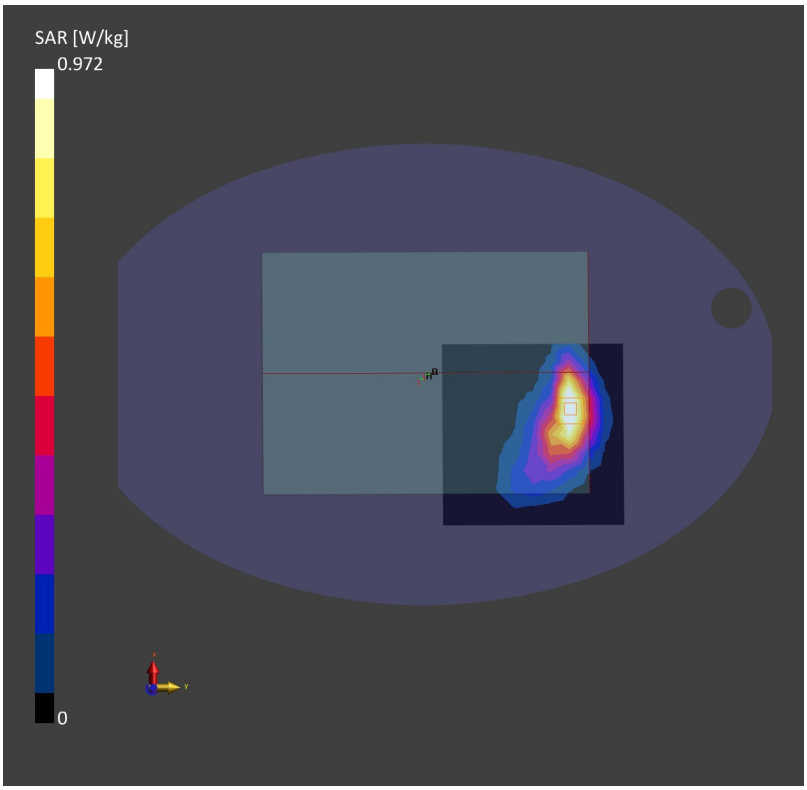
01_GSM850_GPRS (2 Tx slot)_Bottom Face_0mm_Ch251

Communication System: GSM 850; Frequency: 848.8
Medium: HSL. Medium parameters used: f= 848.8 MHz; σ= 0.934 S/m; ε_r = 40.9
Ambient Temperature: 23.2°C; Liquid Temperature: 22.8°C

DASY6 Configuration:
- Probe: EX3DV4 - SN3887; ConvF(9.38, 9.38, 9.38); Calibrated: 2021-10-22
- Sensor-Surface: 1.4 mm
- Electronics: DAE4 Sn1649; Calibrated: 2022-03-30
- Phantom: ELI V8.0 (20deg probe tilt); Serial: 2151; Section: Flat
- Measurement Software: cDASY6 V6.6.0.13926

Area Scan (150.0 mm x 150.0 mm): Measurement Grid: 15.0 mm x 15.0 mm
SAR (1g) = 1.02 W/kg; SAR (10g) = 0.641 W/kg;

Zoom Scan (32.0 mm x 32.0 mm x 30.0 mm): Measurement Grid: 8.0 mm x 8.0 mm x 5.0 mm
Power Drift = -0.04 dB
SAR (1g) = 0.972 W/kg; SAR (10g) = 0.590 W/kg;



Date: 2022-06-05

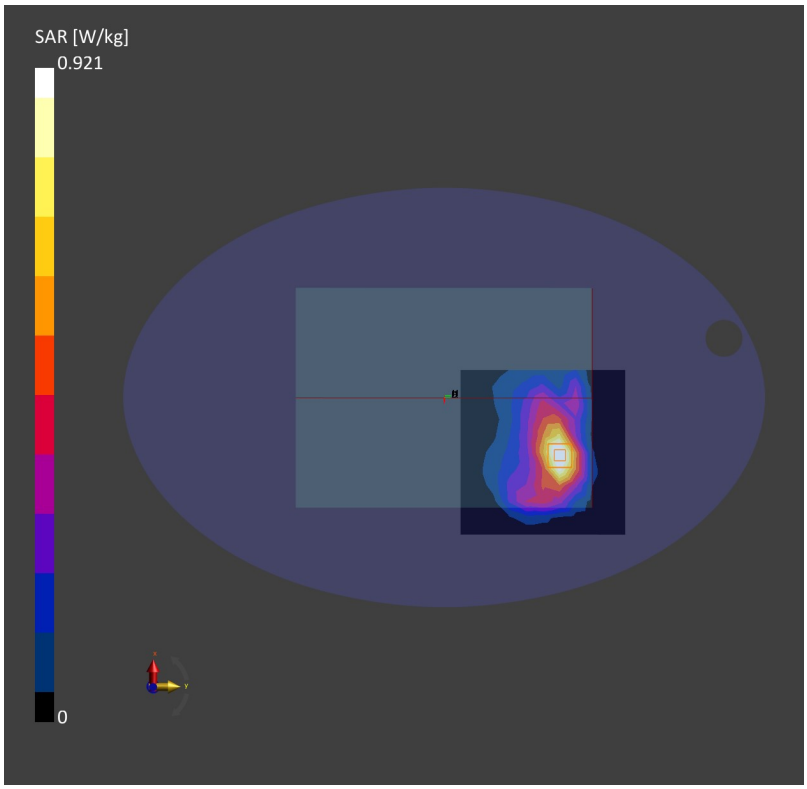
02_LTE Band 25_20M_QPSK_1RB_0Offset_Bottom Face_0mm_Ch26140

Communication System: Band 25, E-UTRA/FDD; Frequency: 1860.0
Medium: HSL. Medium parameters used: f= 1860.0 MHz; σ= 1.45 S/m; ε_r = 40.3
Ambient Temperature: 23.2°C; Liquid Temperature: 22.7°C

DASY6 Configuration:
- Probe: EX3DV4 - SN3887; ConvF(8.20, 8.20, 8.20); Calibrated: 2021-10-22
- Sensor-Surface: 1.4 mm
- Electronics: DAE4 Sn1649; Calibrated: 2022-03-30
- Phantom: ELI V8.0 (20deg probe tilt); Serial: 2151; Section: Flat
- Measurement Software: cDASY6 V6.6.0.13926

Area Scan (150.0 mm x 150.0 mm): Measurement Grid: 15.0 mm x 15.0 mm
SAR (1g) = 0.875 W/kg; SAR (10g) = 0.499 W/kg;

Zoom Scan (32.0 mm x 32.0 mm x 30.0 mm): Measurement Grid: 8.0 mm x 8.0 mm x 5.0 mm
Power Drift = -0.05 dB
SAR (1g) = 0.921 W/kg; SAR (10g) = 0.524 W/kg;



Date: 2022-06-04

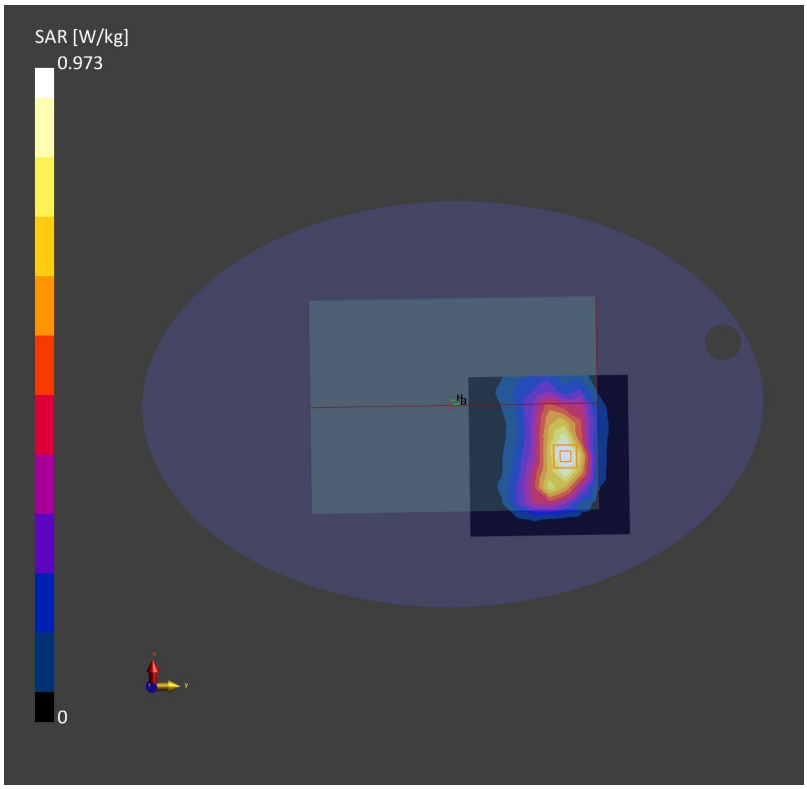
03_LTE Band 4_20M_QPSK_1RB_0Offset_Bottom Face_0mm_Ch20175

Communication System: Band 4, E-UTRA/FDD; Frequency: 1732.5
Medium: HSL. Medium parameters used: f= 1732.5 MHz; σ= 1.38 S/m; ε_r = 40.6
Ambient Temperature: 23.2°C; Liquid Temperature: 22.9°C

DASY6 Configuration:
- Probe: EX3DV4 - SN3887; ConvF(8.42, 8.42, 8.42); Calibrated: 2021-10-22
- Sensor-Surface: 1.4 mm
- Electronics: DAE4 Sn1649; Calibrated: 2022-03-30
- Phantom: ELI V8.0 (20deg probe tilt); Serial: 2151; Section: Flat
- Measurement Software: cDASY6 V6.6.0.13926

Area Scan (150.0 mm x 150.0 mm): Measurement Grid: 15.0 mm x 15.0 mm
SAR (1g) = 0.926 W/kg; SAR (10g) = 0.551 W/kg;

Zoom Scan (32.0 mm x 32.0 mm x 30.0 mm): Measurement Grid: 8.0 mm x 8.0 mm x 5.0 mm
Power Drift = -0.15 dB
SAR (1g) = 0.973 W/kg; SAR (10g) = 0.588 W/kg;



Date: 2022-06-01

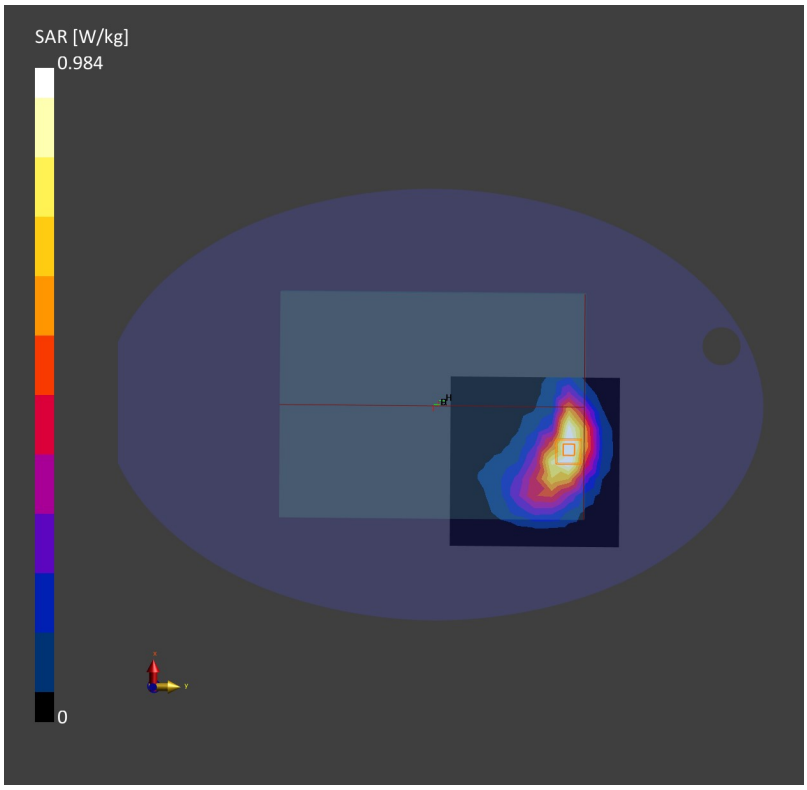
04_LTE Band 12_10M_QPSK_1RB_0Offset_Bottom Face_0mm_Ch23095

Communication System: Band 12, E-UTRA/FDD; Frequency: 707.5
Medium: HSL. Medium parameters used: f= 707.5 MHz; σ= 0.887 S/m; ε_r = 41.7
Ambient Temperature: 23.1°C; Liquid Temperature: 22.7°C

DASY6 Configuration:
- Probe: EX3DV4 - SN3887; ConvF(9.58, 9.58, 9.58); Calibrated: 2021-10-22
- Sensor-Surface: 1.4 mm
- Electronics: DAE4 Sn1649; Calibrated: 2022-03-30
- Phantom: ELI V8.0 (20deg probe tilt); Serial: 2151; Section: Flat
- Measurement Software: cDASY6 V6.6.0.13926

Area Scan (150.0 mm x 150.0 mm): Measurement Grid: 15.0 mm x 15.0 mm
SAR (1g) = 0.944 W/kg; SAR (10g) = 0.624 W/kg;

Zoom Scan (32.0 mm x 32.0 mm x 30.0 mm): Measurement Grid: 8.0 mm x 8.0 mm x 5.0 mm
Power Drift = 0.07 dB
SAR (1g) = 0.984 W/kg; SAR (10g) = 0.630 W/kg;



Date: 2022-06-08

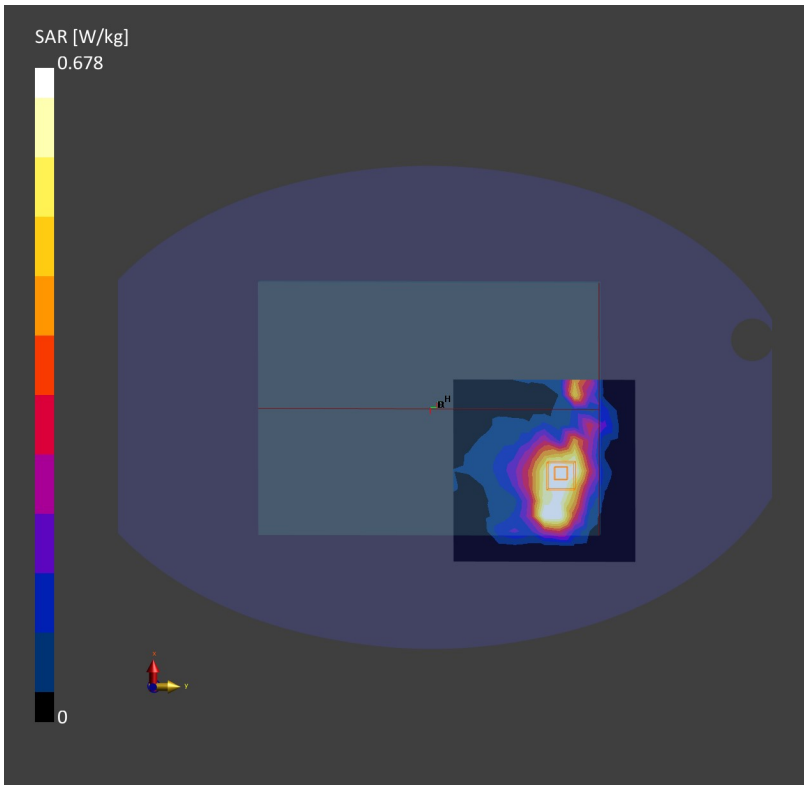
05_LTE Band 41_20M_QPSK_1RB_0Offset_Bottom Face_0mm_Ch41490

Communication System: Band 41, E-UTRA/TDD; Frequency: 2680.0
Medium: HSL. Medium parameters used: f= 2680.0 MHz; σ= 1.97 S/m; ε_r = 38.1
Ambient Temperature: 23.3°C; Liquid Temperature: 22.5°C

DASY6 Configuration:
- Probe: EX3DV4 - SN3887; ConvF(7.24, 7.24, 7.24); Calibrated: 2021-10-22
- Sensor-Surface: 1.4 mm
- Electronics: DAE4 Sn1649; Calibrated: 2022-03-30
- Phantom: ELI V8.0 (20deg probe tilt); Serial: 2151; Section: Flat
- Measurement Software: cDASY6 V6.6.0.13926

Area Scan (144.0 mm x 144.0 mm): Measurement Grid: 12.0 mm x 12.0 mm
SAR (1g) = 0.647 W/kg; SAR (10g) = 0.350 W/kg;

Zoom Scan (30.0 mm x 30.0 mm x 30.0 mm): Measurement Grid: 5.0 mm x 5.0 mm x 5.0 mm
Power Drift = -0.06 dB
SAR (1g) = 0.678 W/kg; SAR (10g) = 0.372 W/kg;



Date: 2022-06-07

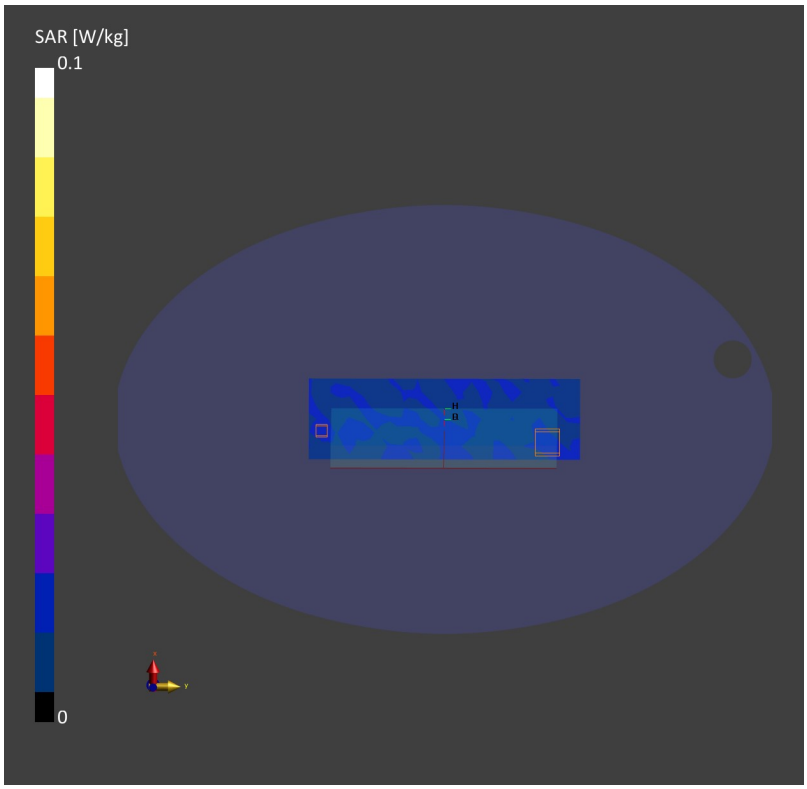
06_Bluetooth_1Mbps_Edge 4_0mm_Ch78

Communication System: ISM 2.4 GHz Band; Frequency: 2480.0
Medium: HSL. Medium parameters used: f= 2480.0 MHz; σ= 1.83 S/m; ε_r = 38.4
Ambient Temperature: 23.2°C; Liquid Temperature: 22.5°C

DASY6 Configuration:
- Probe: EX3DV4 - SN3887; ConvF(7.48, 7.48, 7.48); Calibrated: 2021-10-22
- Sensor-Surface: 1.4 mm
- Electronics: DAE4 Sn1649; Calibrated: 2022-03-30
- Phantom: ELI V8.0 (20deg probe tilt); Serial: 2151; Section: Flat
- Measurement Software: cDASY6 V6.6.0.13926

Area Scan (72.0 mm x 240.0 mm): Measurement Grid: 12.0 mm x 12.0 mm
SAR (1g) = 0.017 W/kg; SAR (10g) = 0.009 W/kg;

Zoom Scan (30.0 mm x 30.0 mm x 30.0 mm): Measurement Grid: 5.0 mm x 5.0 mm x 5.0 mm
Power Drift = -0.05 dB
SAR (1g) = 0.017 W/kg; SAR (10g) = 0.007 W/kg;



Date: 2022-06-07

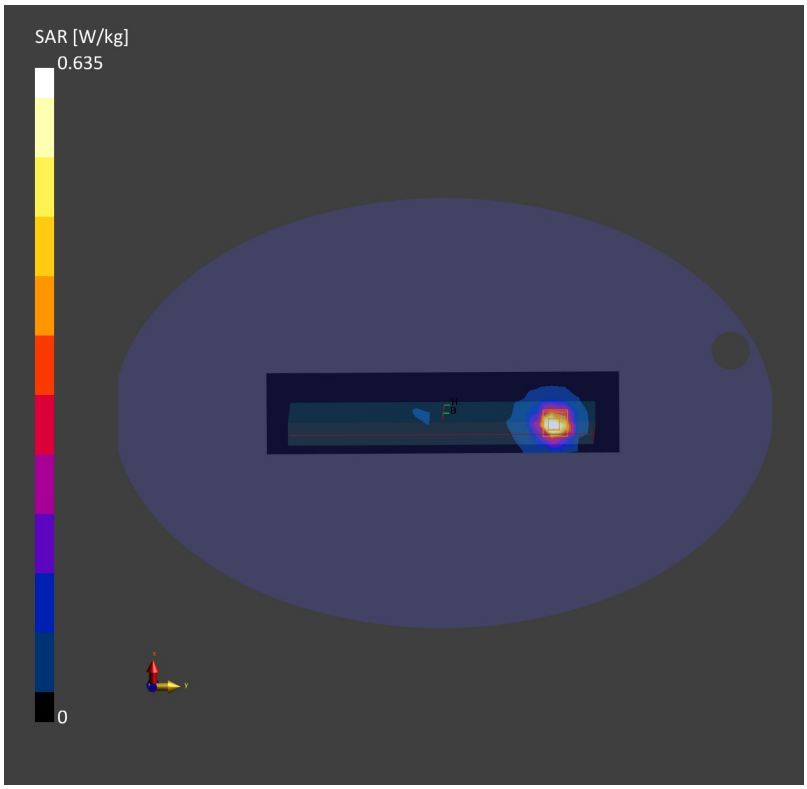
07_WLAN2.4GHz_802.11b 1Mbps_Edge 1_0mm_Ch1

Communication System: WLAN 2.4GHz; Frequency: 2412.0
Medium: HSL. Medium parameters used: f= 2412.0 MHz; σ= 1.79 S/m; ε_r = 39.4
Ambient Temperature: 23.2°C; Liquid Temperature: 22.5°C

DASY6 Configuration:
- Probe: EX3DV4 - SN3887; ConvF(7.48, 7.48, 7.48); Calibrated: 2021-10-22
- Sensor-Surface: 1.4 mm
- Electronics: DAE4 Sn1649; Calibrated: 2022-03-30
- Phantom: ELI V8.0 (20deg probe tilt); Serial: 2151; Section: Flat
- Measurement Software: cDASY6 V6.6.0.13926

Area Scan (72.0 mm x 312.0 mm): Measurement Grid: 12.0 mm x 12.0 mm
SAR (1g) = 0.593 W/kg; SAR (10g) = 0.265 W/kg;

Zoom Scan (30.0 mm x 30.0 mm x 30.0 mm): Measurement Grid: 5.0 mm x 5.0 mm x 5.0 mm
Power Drift = 0.07 dB
SAR (1g) = 0.635 W/kg; SAR (10g) = 0.292 W/kg;



Date: 2022-06-09

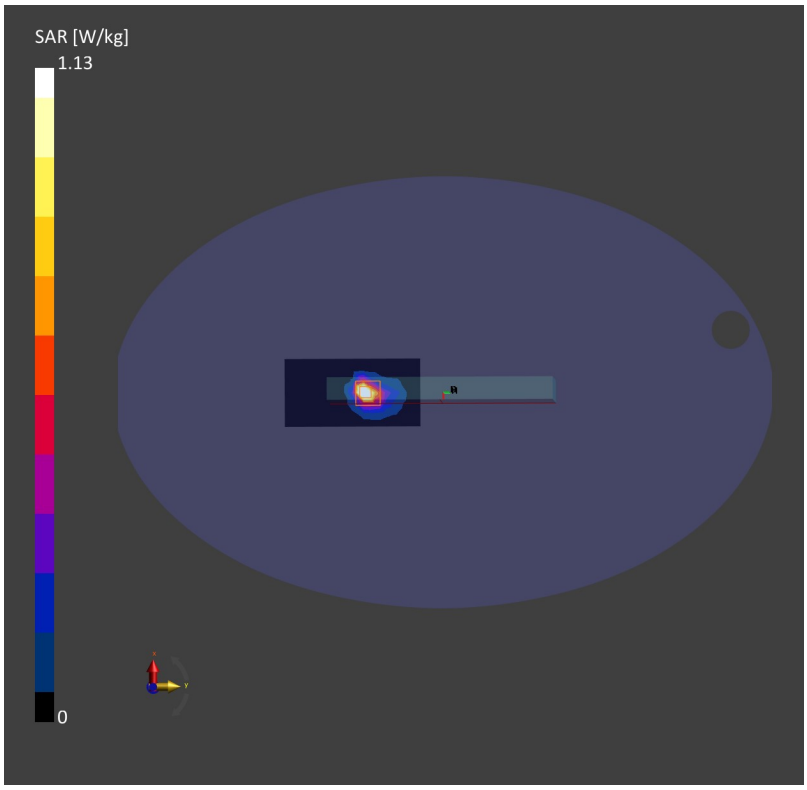
08_WLAN5GHz_802.11n-HT40 MCS0_Edge 4_0mm_Ch54

Communication System: WLAN 5GHz; Frequency: 5270.0
Medium: HSL. Medium parameters used: f= 5270.0 MHz; σ= 4.61 S/m; ε_r = 36.0
Ambient Temperature: 23.2°C; Liquid Temperature: 22.8°C

DASY6 Configuration:
- Probe: EX3DV4 - SN3887; ConvF(4.80, 4.80, 4.80); Calibrated: 2021-10-22
- Sensor-Surface: 1.4 mm
- Electronics: DAE4 Sn1649; Calibrated: 2022-03-30
- Phantom: ELI V8.0 (20deg probe tilt); Serial: 2151; Section: Flat
- Measurement Software: cDASY6 V6.6.0.13926

Area Scan (60.0 mm x 120.0 mm): Measurement Grid: 10.0 mm x 10.0 mm
SAR (1g) = 1.00 W/kg; SAR (10g) = 0.285 W/kg;

Zoom Scan (24.0 mm x 24.0 mm x 22.0 mm): Measurement Grid: 4.0 mm x 4.0 mm x 1.4 mm
Power Drift = 0.13 dB
SAR (1g) = 1.13 W/kg; SAR (10g) = 0.306 W/kg;



Date: 2022-06-10

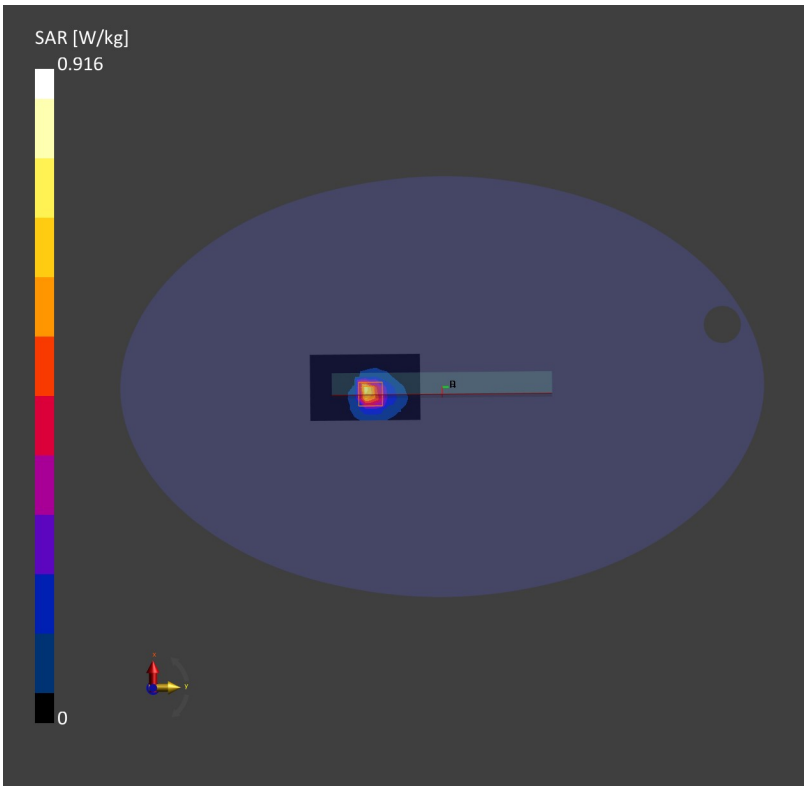
09_WLAN5GHz_802.11n-HT40 MCS0_Edge 4_0mm_Ch110

Communication System: WLAN 5GHz; Frequency: 5550.0
Medium: HSL. Medium parameters used: f= 5550.0 MHz; σ= 4.90 S/m; ε_r = 35.5
Ambient Temperature: 23.1°C; Liquid Temperature: 22.6°C

DASY6 Configuration:
- Probe: EX3DV4 - SN3887; ConvF(4.26, 4.26, 4.26); Calibrated: 2021-10-22
- Sensor-Surface: 1.4 mm
- Electronics: DAE4 Sn1649; Calibrated: 2022-03-30
- Phantom: ELI V8.0 (20deg probe tilt); Serial: 2151; Section: Flat
- Measurement Software: cDASY6 V6.6.0.13926

Area Scan (60.0 mm x 120.0 mm): Measurement Grid: 10.0 mm x 10.0 mm
SAR (1g) = 0.808 W/kg; SAR (10g) = 0.245 W/kg;

Zoom Scan (24.0 mm x 24.0 mm x 22.0 mm): Measurement Grid: 4.0 mm x 4.0 mm x 1.4 mm
Power Drift = 0.01 dB
SAR (1g) = 0.916 W/kg; SAR (10g) = 0.262 W/kg;



Date: 2022-06-11

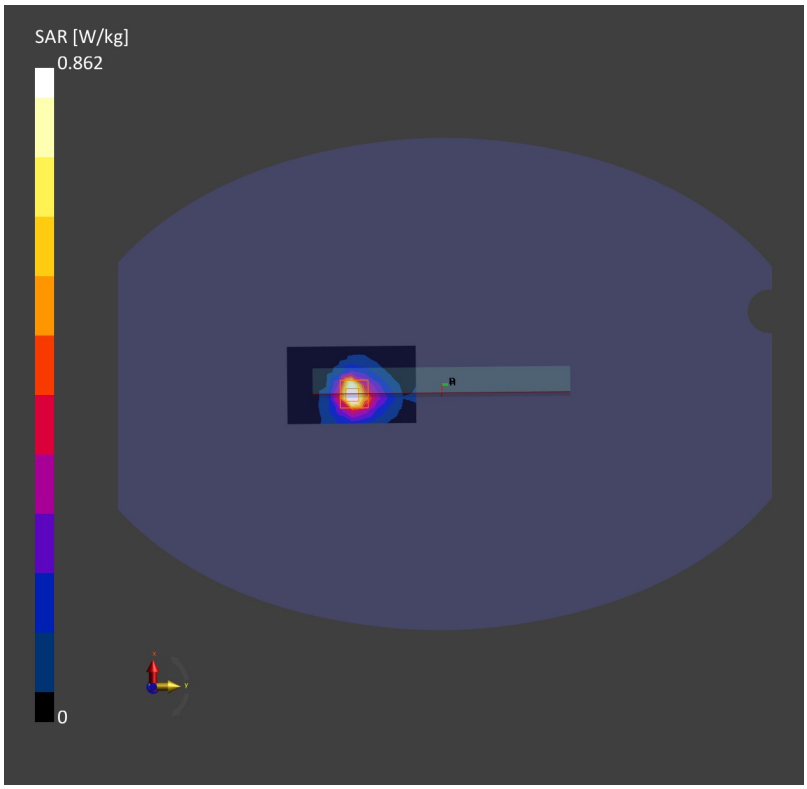
10_WLAN5GHz_802.11n-HT40 MCS0_Edge 4_0mm_Ch159

Communication System: WLAN 5GHz; Frequency: 5795.0
Medium: HSL. Medium parameters used: f= 5795.0 MHz; σ= 5.19 S/m; ε_r = 35.2
Ambient Temperature: 23.1°C; Liquid Temperature: 22.7°C

DASY6 Configuration:
- Probe: EX3DV4 - SN3887; ConvF(4.39, 4.39, 4.39); Calibrated: 2021-10-22
- Sensor-Surface: 1.4 mm
- Electronics: DAE4 Sn1649; Calibrated: 2022-03-30
- Phantom: ELI V8.0 (20deg probe tilt); Serial: 2151; Section: Flat
- Measurement Software: cDASY6 V6.6.0.13926

Area Scan (60.0 mm x 100.0 mm): Measurement Grid: 10.0 mm x 10.0 mm
SAR (1g) = 0.744 W/kg; SAR (10g) = 0.251 W/kg;

Zoom Scan (24.0 mm x 24.0 mm x 22.0 mm): Measurement Grid: 4.0 mm x 4.0 mm x 1.4 mm
Power Drift = 0.03 dB
SAR (1g) = 0.862 W/kg; SAR (10g) = 0.268 W/kg;



Appendix C. DASY Calibration Certificate

The DASY calibration certificates are shown as follows.

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

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

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

Accreditation No.: SCS 0108

Client Sporton

Certificate No: D750V3-1087_Feb22

CALIBRATION CERTIFICATE

Object	D750V3 - SN:1087
Calibration procedure(s)	QA CAL-05.v11 Calibration Procedure for SAR Validation Sources between 0.7-3 GHz
Calibration date:	February 24, 2022

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

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	09-Apr-21 (No. 217-03291/03292)	Apr-22
Power sensor NRP-Z91	SN: 103244	09-Apr-21 (No. 217-03291)	Apr-22
Power sensor NRP-Z91	SN: 103245	09-Apr-21 (No. 217-03292)	Apr-22
Reference 20 dB Attenuator	SN: BH9394 (20k)	09-Apr-21 (No. 217-03343)	Apr-22
Type-N mismatch combination	SN: 310982 / 06327	09-Apr-21 (No. 217-03344)	Apr-22
Reference Probe EX3DV4	SN: 7349	31-Dec-21 (No. EX3-7349_Dec21)	Dec-22
DAE4	SN: 601	01-Nov-21 (No. DAE4-601_Nov21)	Nov-22

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB39512475	30-Oct-14 (in house check Oct-20)	In house check: Oct-22
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-20)	In house check: Oct-22
Power sensor HP 8481A	SN: MY41093315	07-Oct-15 (in house check Oct-20)	In house check: Oct-22
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-20)	In house check: Oct-22
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-20)	In house check: Oct-22

	Name	Function	Signature
Calibrated by:	Joanna Lleshaj	Laboratory Technician	
Approved by:	Niels Kuster	Quality Manager	

Issued: March 2, 2022

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

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

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

Accreditation No.: SCS 0108

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEC/IEEE 62209-1528, "Measurement Procedure For The Assessment Of Specific Absorption Rate Of Human Exposure To Radio Frequency Fields From Hand-Held And Body-Worn Wireless Communication Devices - Part 1528: Human Models, Instrumentation And Procedures (Frequency Range of 4 MHz to 10 GHz)", October 2020.
b) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

c) DASY System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The source is mounted in a touch configuration below the center marking of the flat phantom.
- *Return Loss:* This parameter is measured with the source positioned under the liquid filled phantom (as described in the measurement condition clause). The Return Loss ensures low reflected power. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

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

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY52	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	750 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	41.9	0.89 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	42.4 ± 6 %	0.89 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.14 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**8.58 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.41 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**5.65 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.6 Ω - 2.5 jΩ
Return Loss	- 29.1 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.034 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG

DASY5 Validation Report for Head TSL

Date: 24.02.2022

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN:1087

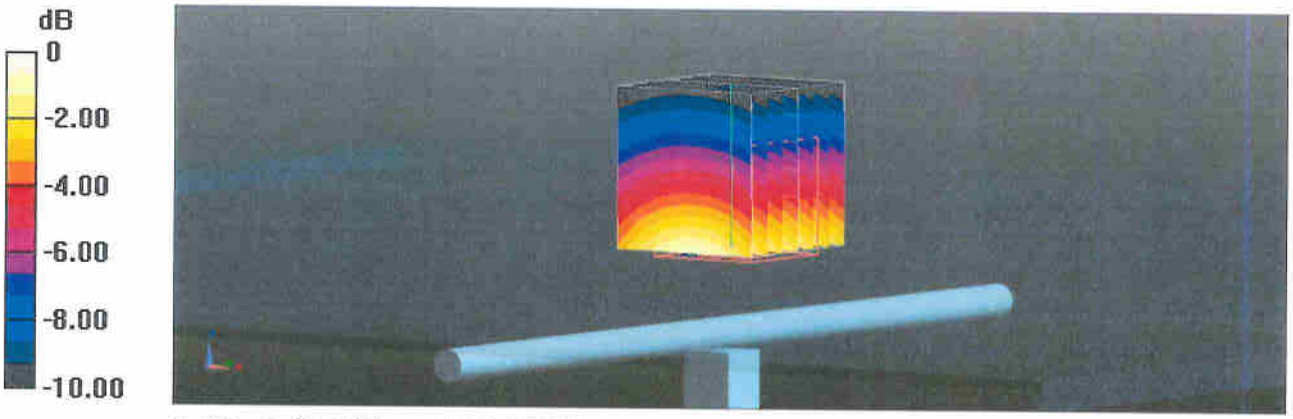
Communication System: UID 0 - CW; Frequency: 750 MHz
Medium parameters used: f = 750 MHz; σ = 0.89 S/m; ε_r = 42.4; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(10.11, 10.11, 10.11) @ 750 MHz; Calibrated: 31.12.2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 01.11.2021
- Phantom: Flat Phantom 4.9 (front); Type: QD 00L P49 AA; Serial: 1001
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 59.64 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 3.22 W/kg
SAR(1 g) = 2.14 W/kg; SAR(10 g) = 1.41 W/kg
Smallest distance from peaks to all points 3 dB below = 17 mm
Ratio of SAR at M2 to SAR at M1 = 66.5%
Maximum value of SAR (measured) = 2.83 W/kg



0 dB = 2.83 W/kg = 4.52 dBW/kg

Impedance Measurement Plot for Head TSL