



SAR TEST REPORT

Applicant ZTE Corporation
FCC ID SRQ-A103ZT
Product 5G Digital Mobile Phone
Model A103ZT
Report No. R2108A0736-S1
Issue Date September 27, 2021

TA Technology (Shanghai) Co., Ltd. tested the above equipment in accordance with the requirements in **IEEE 1528-2013, ANSI C95.1: 1992, IEEE C95.1: 1991**. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Yurui Zhao

Prepared by: Yurui Zhao

Guangchang Fan

Approved by: Guangchang Fan

TA Technology (Shanghai) Co., Ltd.

No.145, Jintang Rd, Tangzhen Industry Park, Pudong Shanghai, China

TEL: +86-021-50791141/2/3

FAX: +86-021-50791141/2/3-8000

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1 Test Laboratory

1.1 Notes of the Test Report

This report shall not be reproduced in full or partial, without the written approval of **TA technology (shanghai) co., Ltd.** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. Measurement Uncertainties were not taken into account and are published for informational purposes only. This report is written to support regulatory compliance of the applicable standards stated above.

1.2 Test facility

FCC (Designation number: CN1179, Test Firm Registration Number: 446626)

TA Technology (Shanghai) Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform measurements.

A2LA (Certificate Number: 3857.01)

TA Technology (Shanghai) Co., Ltd. has been listed by American Association for Laboratory Accreditation to perform measurement.

1.3 Testing Location

Company: TA Technology (Shanghai) Co., Ltd.
Address: No.145, Jintang Rd, Tangzhen Industry Park, Pudong Shanghai, China
City: Shanghai
Post code: 201201
Country: P. R. China
Contact: Fan Guangchang
Telephone: +86-021-50791141/2/3
Fax: +86-021-50791141/2/3-8000
Website: <http://www.ta-shanghai.com>
E-mail: fanguangchang@ta-shanghai.com



1.4 Laboratory Environment

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

2 Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for the EUT are as follows:

Table 1: Highest Reported SAR

Mode	Highest Reported SAR (W/kg)		
	1g SAR Head	1g SAR Body-worn	1g SAR Hotspot
GSM 1900	0.11	0.33	0.88
WCDMA Band II	0.19	0.49	1.19
WCDMA Band IV	0.16	0.40	1.10
LTE FDD 2	0.12	0.40	1.11
LTE TDD 41	0.16	0.32	0.51
Wi-Fi (2.4G)	1.47	0.14	0.37
Wi-Fi (5G)	1.47	0.29	0.42
BT	0.11	0.02	0.05

Date of Testing: August 19, 2021 ~ September 4, 2021

Date of Sample Received: August 16, 2021

Note: 1. The device is in compliance with SAR for Uncontrolled Environment /General Population exposure limits (1.6 W/kg and 4.0 W/kg) specified in ANSI C95.1: 1992/IEEE C95.1: 1991, and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2013.

2.All indications of Pass/Fail in this report are opinions expressed by TA Technology (Shanghai) Co., Ltd. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only.

Table 2: Highest Simultaneous Transmission SAR

Exposure Configuration	1g SAR Head	1g SAR Body-worn (Separation 15mm)	1g SAR Hotspot (Separation 10mm)
Highest Simultaneous Transmission SAR (W/kg)	1.577	0.775	1.282

Note: The detail for simultaneous transmission consideration is described in chapter 10.3.

3 Description of Equipment under Test

Client Information

Applicant	ZTE Corporation
Applicant address	ZTE Plaza, Keji Road South, Hi-Tech, Industrial Park, Nanshan District, Shenzhen, Guangdong, 518057, P.R.China
Manufacturer	ZTE Corporation
Manufacturer address	ZTE Plaza, Keji Road South, Hi-Tech, Industrial Park, Nanshan District, Shenzhen, Guangdong, 518057, P.R.China

General Technologies

Application Purpose	Original Grant
EUT Stage	Identical Prototype
Model	A103ZT
IMEI	IMEI1:863601050009811 IMEI2:863601050014217
Hardware Version	zm3A
Software Version	A103ZT a.1.0
Antenna Type	Internal Antenna
Device Class	B
Wi-Fi Hotspot	Wi-Fi 2.4G Wi-Fi 5G U-NII-1
Power Class	GSM 1900: 1 UMTS Band II/IV: 3 LTE FDD 2: 3 LTE TDD 41: 2
Power Level	GSM 1900: level 0 UMTS Band II/IV: all up bits LTE FDD 2: max power LTE TDD 41: max power
EUT Accessory	
Battery	Manufacturer: NingDe Amperex Technoiogy Ltd. Model: Li3939T44P8h896443
USB to Type C cable	Manufacturer: kingpower-tech Model: USBAF-TC20-B-15-HF
Type-C to 3.5 mm Headphone Jack	Manufacturer: JUWEI ELECTRONICS CO., LTD Model: JWUB1430-Z01
Note: The EUT is sent from the applicant to TA and the information of the EUT is declared by the applicant.	

Wireless Technology and Frequency Range

Wireless Technology		Modulation	Operating mode	Tx (MHz)
GSM	1900	Voice(GMSK) GPRS(GMSK) EGPRS(GMSK,8PSK)	<input type="checkbox"/> Multi-slot Class:8-1UP <input type="checkbox"/> Multi-slot Class:10-2UP <input checked="" type="checkbox"/> Multi-slot Class:12-4UP <input type="checkbox"/> Multi-slot Class:33-4UP	1850 ~ 1910
	Does this device support DTM (Dual Transfer Mode)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			
UMTS	Band II	QPSK, 16QAM	HSDPA UE Category: 7 HSUPA UE Category: 12	1850 ~ 1910
	Band IV			1710 ~ 1755
LTE	FDD 2	QPSK, 16QAM, 64QAM	Category 5	1850 ~ 1910
	TDD 41			2496 ~ 2690
	Does this device support Carrier Aggregation (CA) <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			
	Does this device support SV-LTE (1xRTT-LTE)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			
BT	2.4G	Version 5.0 LE		2402 ~2480
Wi-Fi	2.4G	DSSS, OFDM	802.11b/g/n HT20	2412 ~ 2462
		OFDM	802.11n HT40	2422 ~ 2452
	5G	OFDM	802.11a/n HT20/ HT40/ ac VHT20/ VHT40/ VHT80	5150 ~ 5250
				5250 ~ 5350 5470 ~ 5725
Does this device support MIMO <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No				
NFC	13.56MHz			



4 Test Specification, Methods and Procedures

The tests documented in this report were performed in accordance with FCC 47 CFR § 2.1093, IEEE 1528- 2013, ANSI C95.1: 1992, IEEE C95.1: 1991, the following FCC Published RF exposure KDB procedures:

IEC 62209-1

Reference Standards

KDB 248227 D01 802.11Wi-Fi SAR v02r02

KDB 447498 D01 General RF Exposure Guidance v06

KDB 648474 D04 Handset SAR v01r03

KDB 690783 D01 SAR Listings on Grants v01r03

KDB 865664 D01 SAR measurement 100 MHz to 6 GHz v01r04

KDB 865664 D02 RF Exposure Reporting v01r02

KDB 941225 D01 3G SAR Procedures v03r01

KDB 941225 D05 SAR for LTE Devices v02r05

KDB 941225 D05A LTE Rel.10 KDB Inquiry Sheet v01r02

KDB 941225 D06 Hotspot Mode v02r01

5 Operational Conditions during Test

5.1 Test Positions

5.1.1 Against Phantom Head

Measurements were made in “cheek” and “tilt” positions on both the left hand and right hand sides of the phantom.

The positions used in the measurements were according to IEEE 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".

5.1.2 Body Worn Configuration

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.

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

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

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

5.1.3 Phablet SAR test considerations

For smart phones, with a display diagonal dimension > 15.0 cm or an overall diagonal dimension > 16.0 cm, that can provide similar mobile web access and multimedia support found in mini-tablets or UMPC mini-tablets and support voice calls next to the ear, unless it is confirmed otherwise through KDB inquiries, the following phablet procedures should be applied to evaluate SAR compliance for each applicable wireless modes and frequency band. Devices marketed as phablets, regardless of form factors and operating characteristics must be tested as a phablet to determine SAR compliance.

- a) The normally required head and body-worn accessory SAR test procedures for handsets, including hotspot mode, must be applied.
- b) The UMPC mini-tablet procedures must also be applied to test the SAR of all surfaces and edges with an antenna located at ≤ 25 mm from that surface or edge, in direct contact with a flat phantom, for product specific 10-g SAR according to the body-equivalent tissue dielectric parameters in KDB Publication 865664 D01 to address interactive hand use exposure conditions. The 1-g SAR at 5 mm for UMPC mini-tablets is not required. When hotspot mode applies, product specific 10-g SAR is required only for the surfaces and edges with hotspot mode 1-g reported SAR > 1.2 W/kg; however, when power reduction applies to hotspot mode the measured SAR must be scaled to the maximum output power, including tolerance, allowed for phablet modes to compare with the 1.2 W/kg SAR test reduction threshold. The normal tablet procedures in KDB Publication 616217 are required when the overall diagonal dimension of the device is > 20.0 cm. Hotspot mode SAR is not required when normal tablet procedures are applied. Product specific 10-g SAR is also not required for the front (top) surface of larger form factor full size tablets. The more conservative normal tablet SAR results can be used to support phablet mode product specific 10-g SAR.
- c) The simultaneous transmission operating configurations applicable to voice and data transmissions for both phone and mini-tablet modes must be taken into consideration separately for 1-g and 10-g SAR to determine the simultaneous transmission SAR test exclusion and measurement requirements for the relevant wireless modes and exposure conditions.

5.2 Measurement Variability

Per FCC KDB Publication 865664 D01, SAR measurement variability was assessed for each frequency band, which was determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. When both head and body tissue-equivalent media were required for SAR measurements in a frequency band, the variability measurement procedures were applied to the tissue medium with the highest measured SAR, using the highest measured SAR configuration for that tissue-equivalent medium. These additional measurements were repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device was returned to ambient conditions (normal room temperature) with the battery fully charged before it was re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

SAR Measurement Variability was assessed using the following procedures for each frequency band:

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

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.

5.3 Test Configuration

5.3.1 GSM Test Configuration

According to specification 3GPP TS 51.010, the maximum power of the GSM can do the power reduction for the multi-slot. The allowed power reduction in the multi-slot configuration is as following:

Output power of reductions:

Table 3: The allowed power reduction in the multi-slot configuration

Number of timeslots in uplink assignment	Permissible nominal reduction of maximum output power (dB)
1	0
2	0 to 3,0
3	1,8 to 4,8
4	3,0 to 6,0

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

5.3.2 UMTS Test Configuration

5.3.2.1 3G SAR Test Reduction Procedure

The default test configuration is to measure SAR with an established radio link between the EUT and a communication test set using a 12.2 kbps RMC (reference measurement channel) configured in Test Loop Mode 1. SAR is selectively confirmed for other physical channel configurations modes according to output power, exposure conditions and device operating capabilities. Maximum output power is verified by applying the applicable versions of 3GPP TS 34.121.

5.3.2.2 Head SAR

SAR for next to the ear head exposure is measured using a 12.2 kbps RMC with TPC bits configured to all "1's". The 3G SAR test reduction procedure is applied to AMR configurations with 12.2 kbps RMC as the primary mode. Otherwise, SAR is measured for 12.2 kbps AMR in 3.4 kbps SRB (signaling radio bearer) using the highest SAR configuration in 12.2 kbps RMC for head exposure.

5.3.2.3 Body-worn accessory SAR

SAR for body-worn accessory configurations is measured using a 12.2 kbps RMC with TPC bits configured to all “1’s”. The 3G SAR test reduction procedure is applied to other spreading codes and multiple DPDCHn configurations supported by the EUT with 12.2 kbps RMC as the primary mode. Otherwise, SAR is measured using an applicable RMC configuration with the corresponding spreading code or DPDCHn, for the highest reported body-worn accessory exposure SAR configuration in 12.2 kbps RMC. When more than 2 DPDCHn are supported by the EUT, it may be necessary to configure additional DPDCHn using FTM (Factory Test Mode) or other chipset based test approaches with parameters similar to those used in 384 kbps and 768 kbps RMC

5.3.2.4 Release 5 HSDPA Test Configuration

The 3G SAR test reduction procedure is applied to HSDPA body-worn accessory configurations with 12.2 kbps RMC as the primary mode. Otherwise, SAR is measured for HSDPA using the HSDPA body SAR procedures in the “Release 5 HSDPA Data Devices” section of this document, for the highest SAR body-worn accessory exposure configuration in 12.2 kbps RMC. EUT with both HSDPA and HSUPA are tested according to Release 6 HSPA test procedures.

HSDPA should be configured according to the UE category of a test device. The number of HSDSCH/HS-PDSCHs, HARQ processes, minimum inter-TTI interval, transport block sizes and RV coding sequence are defined by the H-set. To maintain a consistent test configuration and stable transmission conditions, QPSK is used in the H-set for SAR testing. HS-DPCCH should be configured with a CQI feedback cycle of 4 ms with a CQI repetition factor of 2 to maintain a constant rate of active CQI slots. DPCCH and DPDCH gain factors (β_c , β_d), and HS-DPCCH power offset parameters (Δ_{ACK} , Δ_{NACK} , Δ_{CQI}) should be set according to values indicated in the Table below. The CQI value is determined by the UE category, transport block size, number of HS-PDSCHs and modulation used in the H-set.

Table 4: Subtests for UMTS Release 5 HSDPA

Sub-set	β_c	β_d	β_d (SF)	β_c/β_d	β_{hs} (note 1, note 2)	CM(dB) (note 3)	MPR(dB)
1	2/15	15/15	64	2/15	4/15	0.0	0.0
2	12/15 (note 4)	15/15 (note 4)	64	12/15 (note 4)	24/15	1.0	0.0
3	15/15	8/15	64	15/8	30/15	1.5	0.5
4	15/15	4/15	64	15/4	30/15	1.5	0.5

Note 1: Δ_{ACK} , Δ_{NACK} and $\Delta_{CQI} = 8 \Leftrightarrow A_{hs} = \beta_{hs}/\beta_c = 30/15 \Leftrightarrow \beta_{hs} = 30/15 * \beta_c$
 Note 2: CM=1 for $\beta_c/\beta_d = 12/15$, $\beta_{hs}/\beta_c = 24/15$.
 Note 3: For subtest 2 the β_c/β_d ratio of 12/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signaled gain factors for the reference TFC (TFC1, TF1) to $\beta_c = 11/15$ and $\beta_d = 15/15$.

5.3.2.5 Release 6 HSUPA Test Configuration

The 3G SAR test reduction procedure is applied to HSPA (HSUPA/HSDPA with RMC) body-worn accessory configurations with 12.2 kbps RMC as the primary mode. Otherwise, SAR is measured for HSPA using the HSPA body SAR procedures in the “Release 6 HSPA Data Devices” section of this document, for the highest body-worn accessory exposure SAR configuration in 12.2 kbps RMC. When VOIP is applicable for next to the ear head exposure in HSPA, the 3G SAR test reduction procedure is applied to HSPA with 12.2 kbps RMC as the primary mode; otherwise, the same HSPA configuration used for body-worn accessory measurements is tested for next to the ear head exposure.

Due to inner loop power control requirements in HSPA, a communication test set is required for output power and SAR tests. The 12.2 kbps RMC, FRC H-set 1 and E-DCH configurations for HSPA are configured according to the β values indicated in Table 2 and other applicable procedures described in the ‘WCDMA EUT’ and ‘Release 5 HSDPA Data Devices’ sections of this document

Table 5: Sub-Test 5 Setup for Release 6 HSUPA

Sub-set	β_c	β_d	β_d (SF)	β_c/β_d	$\beta_{hs}^{(1)}$	β_{ec}	β_{ed}	β_{ed} (SF)	β_{ed} (codes)	CM ⁽²⁾ (dB)	MPR (dB)	AG ⁽⁴⁾ Index	E-TFCI
1	11/15 ⁽³⁾	15/15 ⁽³⁾	64	11/15 ⁽³⁾	22/15	209/225	1039/225	4	1	1.0	0.0	20	75
2	6/15	15/15	64	6/15	12/15	12/15	94/75	4	1	3.0	2.0	12	67
3	15/15	9/15	64	15/9	30/15	30/15	β_{ed1} 47/15 β_{ed2} 47/15	4	2	2.0	1.0	15	92
4	2/15	15/15	64	2/15	4/15	2/15	56/75	4	1	3.0	2.0	17	71
5	15/15 ⁽⁴⁾	15/15 ⁽⁴⁾	64	15/15 ⁽⁴⁾	30/15	24/15	134/15	4	1	1.0	0.0	21	81

Note 1: $\Delta_{ACK}, \Delta_{NACK}$ and $\Delta_{CQI} = 8 \Leftrightarrow A_{hs} = \beta_{hs}/\beta_c = 30/15 \Leftrightarrow \beta_{hs} = 30/15 * \beta_c$.

Note 2: CM = 1 for $\beta_c/\beta_d = 12/15, \beta_{hs}/\beta_c = 24/15$. For all other combinations of DPDCH, DPCCH, HS- DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference.

Note 3: For subtest 1 the β_c/β_d ratio of 11/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signaled gain factors for the reference TFC (TF1, TF1) to $\beta_c = 10/15$ and $\beta_d = 15/15$.

Note 4: For subtest 5 the β_c/β_d ratio of 15/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signaled gain factors for the reference TFC (TF1, TF1) to $\beta_c = 14/15$ and $\beta_d = 15/15$.

Note 5: Testing UE using E-DPDCH Physical Layer category 1 Sub-test 3 is not required according to TS 25.306 Figure 5.1g.

Note 6: β_{ed} cannot be set directly; it is set by Absolute Grant Value.

Table 6: HSUPA UE category

UE E-DCH Category	Maximum E-DCH Codes Transmitted	Number of HARQ Processes	E-DCHTTI (ms)	Minimum Spreading Factor	Maximum E-DCH Transport Block Bits	Max Rate (Mbps)
1	1	4	10	4	7110	0.7296
2	2	8	2	4	2798	1.4592
	2	4	10	4	14484	
3	2	4	10	4	14484	1.4592



4	2	8	2	2	5772	2.9185
	2	4	10	2	20000	2.00
5	2	4	10	2	20000	2.00
6 (No DPDCH)	4	8	2	2 SF2 & 2	11484	5.76
	4	4	10	SF4	20000	2.00
7 (No DPDCH)	4	8	2	2 SF2 & 2 SF4	22996	?
	4	4	10		20000	?

NOTE: When 4 codes are transmitted in parallel, two codes shall be transmitted with SF2 and two with SF4.
 UE Categories 1 to 6 supports QPSK only. UE Category 7 supports QPSK and 16QAM.
 (TS25.306-7.3.0)

5.3.2.6 HSPA and HSPA+ Test Configuration

SAR test exclusion may apply to 3GPP Rel. 6 HSPA. When SAR measurement is required for HSPA, a KDB inquiry is required to confirm that the wireless mode configurations in the test setup have remained stable throughout the SAR measurements. Without prior KDB confirmation to determine the SAR results are acceptable, a PAG is required for equipment approval.

SAR test exclusion for HSPA, HSPA+ is determined according to the following:

- 1) The HSPA procedures are applied to configure 3GPP Rel. 6 HSPA devices in the required sub-test mode(s) to determine SAR test exclusion.
- 2) SAR is required for Rel. 7 HSPA+ when SAR is required for Rel. 6 HSPA; otherwise, the 3G SAR test reduction procedure is applied to (uplink) HSPA+ with 12.2 kbps RMC as the primary mode. Power is measured for HSPA+ that supports uplink 16 QAM according to configurations in Table C.11.1.4 of 3GPP TS 34.121-1 to determine SAR test reduction.
- 3) Regardless of whether a PBA is required, the following information must be verified and included in the SAR report for devices supporting HSPA, HSPA+:
 - a) The output power measurement results and applicable release version(s) of 3GPP TS 34.121. Power measurement difficulties due to test equipment setup or availability must be resolved between the grantee and its test lab.
 - b) The power measurement results are in agreement with the individual device implementation and specifications. When Enhanced MPR (E-MPR) applies, the normal MPR targets may be modified according to the Cubic Metric (CM) measured by the device, which must be taken into consideration.
 - c) The UE category, operating parameters, such as the β and Δ values used to configure the device for testing, power setback procedures described in 3GPP TS 34.121 for the power measurements, and HSPA/HSPA+ channel conditions (active and stable) for the entire duration of the measurement according to the required E-TFCI and AG index values.
- 4) When SAR measurement is required, the test configurations, procedures and power measurement results must be clearly described to confirm that the required test parameters are used, including E-TFCI and AG index stability and output power conditions.

Table 7: HS-DSCH UE category

HS-DSCH category	Maximum number of HS-DSCH codes received	Minimum inter-TTI interval	Maximum number of bits of an HS-DSCH transport block received within an HS-DSCH TTI NOTE 1	Total number of soft channel bits	Supported modulations without MIMO operation or dual cell operation	Supported modulations with MIMO operation and without dual cell operation	Supported modulations with dual cell operation	
Category 1	5	3	7298	19200	QPSK, 16QAM	Not applicable (MIMO not supported)	Not applicable (dual cell operation not supported)	
Category 2	5	3	7298	28800				
Category 3	5	2	7298	28800				
Category 4	5	2	7298	38400				
Category 5	5	1	7298	57600				
Category 6	5	1	7298	67200				
Category 7	10	1	14411	115200				
Category 8	10	1	14411	134400				
Category 9	15	1	20251	172800				
Category 10	15	1	27952	172800				
Category 11	5	2	3630	14400				QPSK
Category 12	5	1	3630	28800				QPSK, 16QAM, 64QAM
Category 13	15	1	35280	259200				QPSK, 16QAM
Category 14	15	1	42192	259200				QPSK, 16QAM
Category 15	15	1	23370	345600	QPSK, 16QAM			
Category 16	15	1	27952	345600	QPSK, 16QAM			
Category 17 NOTE 2	15	1	35280	259200	QPSK, 16QAM, 64QAM	-		
			23370	345600	-	QPSK, 16QAM		
Category 18 NOTE 3	15	1	42192	259200	QPSK, 16QAM, 64QAM	-		
			27952	345600	-	QPSK, 16QAM		
Category 19	15	1	35280	518400	QPSK, 16QAM, 64QAM			
Category 20	15	1	42192	518400	QPSK, 16QAM, 64QAM			
Category 21	15	1	23370	345600	-	-	QPSK, 16QAM	
Category 22	15	1	27952	345600				
Category 23	15	1	35280	518400				
Category 24	15	1	42192	518400			QPSK, 16QAM, 64QAM	

5.3.3 LTE Test Configuration

LTE modes were tested according to FCC KDB 941225 D05 publication. Please see notes after the tabulated SAR data for required test configurations. Establishing connections with base station simulators ensure a consistent means for testing SAR and are recommended for evaluating SAR. The R&S CMW500 was used for LTE output power measurements and SAR testing. Max power control was used so the UE transmits with maximum output power during SAR testing. SAR must be measured with the maximum TTI (transmit time interval) supported by the device in each LTE configuration.

A) Spectrum Plots for RB Configurations

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

B) MPR

MPR is permanently implemented for this device by the manufacturer. The specific manufacturer target MPR is indicated alongside the SAR results. MPR is enabled for this device, according to

3GPP TS36.101 Section 6.2.3 – 6.2.5 under Table 6.2.3-1.

C) A-MPR

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

D) Largest channel bandwidth standalone SAR test requirements

1) QPSK with 1 RB allocation

Start with the largest channel bandwidth and measure SAR for QPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power for RB offsets at the upper edge, middle and lower edge of each required test channel. When the reported SAR is ≤ 0.8 W/kg, testing of the remaining RB offset configurations and required test channels is not required for 1 RB allocation; otherwise, SAR is required for the remaining required test channels and only for the RB offset configuration with the highest output power for that channel. When the reported SAR of a required test channel is > 1.45 W/kg, SAR is required for all three RB offset configurations for that required test channel.

2) QPSK with 50% RB allocation

The procedures required for 1 RB allocation in 1) are applied to measure the SAR for QPSK with 50% RB allocation.

3) QPSK with 100% RB allocation

For QPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100% RB allocation is less than the highest maximum output power in 50% and 1 RB allocations and the highest reported SAR for 1 RB and 50% RB allocation in 1) and 2) are ≤ 0.8 W/kg. Otherwise, SAR is measured for the highest output power channel and if the reported SAR is > 1.45 W/kg, the remaining required test channels must also be tested.

4) Higher order modulations

For each modulation besides QPSK; e.g., 16-QAM, 64-QAM, apply the QPSK procedures in above sections to determine the QAM configurations that may need SAR measurement. For each configuration identified as required for testing, SAR is required only when the highest maximum output power for the configuration in the higher order modulation is $> \frac{1}{2}$ dB higher than the same configuration in QPSK or when the reported SAR for the QPSK configuration is > 1.45 W/kg.

E) Other channel bandwidth standalone SAR test requirements

For the other channel bandwidths used by the device in a frequency band, apply all the procedures required for the largest channel bandwidth in section A) to determine the channels and RB configurations that need SAR testing and only measure SAR when the highest maximum output power of a configuration requiring testing in the smaller channel bandwidth is $> \frac{1}{2}$ dB higher than the equivalent channel configurations in the largest channel bandwidth configuration or the reported SAR of a configuration for the largest channel bandwidth is > 1.45 W/kg.

5.3.4 Additional requirements for TDD LTE specification

For Time-Division Duplex (TDD) systems, SAR must be tested using a fixed periodic duty factor according to the highest transmission duty factor implemented for the device and supported by the defined 3GPP LTE TDD configurations.

TDD LTE Band supports 3GPP TS 36.211 section 4.2 for Type 2 Frame Structure and Table: Uplink-downlink configurations for uplink-downlink configurations and Table: Configuration of special subframe (lengths of DwPTS/GP/UpPTS) for Special subframe configurations.

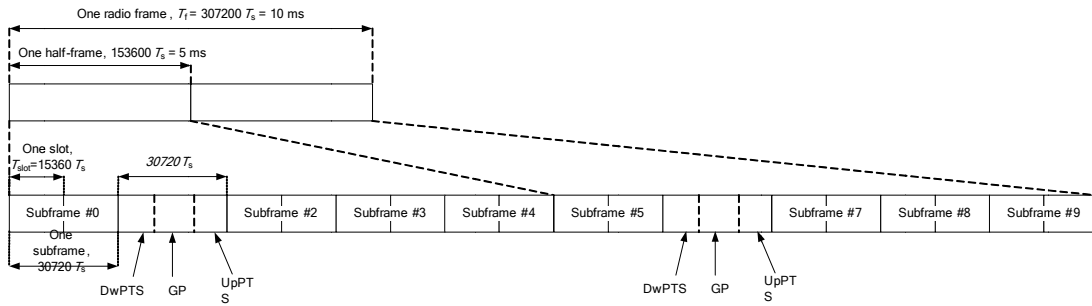


Figure 1: Frame structure type 2

Table 8: Configuration of special subframe (lengths of DwPTS/GP/UpPTS)

Special subframe configuration	Normal cyclic prefix in downlink			Extended cyclic prefix in downlink		
	DwPTS	UpPTS		DwPTS	UpPTS	
		Normal cyclic prefix in uplink	Extended cyclic prefix in uplink		Normal cyclic prefix in uplink	Extended cyclic prefix in uplink
0	$6592 \cdot T_s$	$2192 \cdot T_s$	$2560 \cdot T_s$	$7680 \cdot T_s$	$2192 \cdot T_s$	$2560 \cdot T_s$
1	$19760 \cdot T_s$			$20480 \cdot T_s$		
2	$21952 \cdot T_s$			$23040 \cdot T_s$		
3	$24144 \cdot T_s$			$25600 \cdot T_s$		
4	$26336 \cdot T_s$			$7680 \cdot T_s$	$4384 \cdot T_s$	$5120 \cdot T_s$
5	$6592 \cdot T_s$	$20480 \cdot T_s$				
6	$19760 \cdot T_s$	$23040 \cdot T_s$				
7	$21952 \cdot T_s$	$4384 \cdot T_s$	$5120 \cdot T_s$	$12800 \cdot T_s$	-	-
8	$24144 \cdot T_s$	-	-	-	-	-
9	$13168 \cdot T_s$	-	-	-	-	-

Table 9: Uplink-downlink configurations



Uplink-downlink configuration	Downlink-to-Uplink Switch-point periodicity	Subframe number									
		0	1	2	3	4	5	6	7	8	9
0	5 ms	D	S	U	U	U	D	S	U	U	U
1	5 ms	D	S	U	U	D	D	S	U	U	D
2	5 ms	D	S	U	D	D	D	S	U	D	D
3	10 ms	D	S	U	U	U	D	D	D	D	D
4	10 ms	D	S	U	U	D	D	D	D	D	D
5	10 ms	D	S	U	D	D	D	D	D	D	D
6	5 ms	D	S	U	U	U	D	S	U	U	D

According to Figure 1, one radio frame is configured by 10 subframes, which consist of Uplink-subframe, Downlink-subframe and Special subframe. For TDD-LTE, the Duty Cycle should be calculated on Uplink-subframes and Special subframes, due to Special subframe containing both Uplink transmissions. So for one radio frame, Duty Cycle can be calculated with formula as below. The count of Uplink subframes are according to Table: Uplink-downlink configurations:

$$\text{Duty cycle} = (30720\text{Ts} * \text{Ups} + \text{Uplink Component} * \text{Specials}) / (307200\text{Ts})$$

About the uplink component of Special subframes, we can figure out by Table: Configuration of special subframe (lengths of DwPTS/GP/UpPTS):

$$\text{Uplink Component} = \text{UpPTS}$$

In conclusion, for the TDD LTE Band, Duty Cycle can be calculated with formula as below. All these sets are ok when we test, or we can set as below.

$$\text{Duty cycle} = [(30720\text{Ts} * \text{Ups}) + \text{UpPTS} * \text{Specials}] / (307200\text{Ts})$$

And we can get different Duty cycles under different configurations:

Uplink-downlink configuration	Subframe number			Configuration of special subframe							
				Normal cyclic prefix in downlink				Extended cyclic prefix in downlink			
	D	S	U	Normal cyclic prefix in uplink		Extended cyclic prefix in uplink		Normal cyclic prefix in uplink		Extended cyclic prefix in uplink	
				configuration 0~4	configuration 5~9	configuration 0~4	configuration 5~9	configuration 0~3	configuration 4~7	configuration 0~3	configuration 4~7
0	2	2	6	61.43%	62.85%	61.67%	63.33%	61.43%	62.85%	61.67%	63.33%
1	4	2	4	41.43%	42.85%	41.67%	43.33%	41.43%	42.85%	41.67%	43.33%
2	6	2	2	21.43%	22.85%	21.67%	23.33%	21.43%	22.85%	21.67%	23.33%
3	6	1	3	30.71%	31.43%	30.83%	31.67%	30.71%	31.43%	30.83%	31.67%
4	7	1	2	20.71%	21.43%	20.83%	21.67%	20.71%	21.43%	20.83%	21.67%
5	8	1	1	10.71%	11.43%	10.83%	11.67%	10.71%	11.43%	10.83%	11.67%
6	3	2	5	51.43%	52.85%	51.67%	53.33%	51.43%	52.85%	51.67%	53.33%

SAR test Plan: For TDD LTE, SAR should be tested with the highest transmission duty factor (63.33%) using Uplink-downlink configuration 0 and Special subframe configuration 7 for Frame structure type

The screenshot shows the 'LTE Signaling - Configuration' window. The 'Physical Cell Setup' section is highlighted with a red box. The 'TDD' section is also highlighted with a red box, showing 'Use Carrier Specific' checked and 'Uplink Downlink Configurat...' set to 0. A table below shows subframe directions: 0 (DL), 1 (S), 2 (U), 3 (U), 4 (U), 5 (DL), 6 (S), 7 (U), 8 (U), 9 (U). The 'LTE Signaling' button on the right is highlighted with a red box and shows 'ON'.

Subframe Number	Direction
0	↓ S
1	↑ S
2	↑ U
3	↑ U
4	↑ U
5	↓ S
6	↑ S
7	↑ U
8	↑ U
9	↑ U

5.3.5 Wi-Fi Test Configuration

SAR test reduction for 802.11 Wi-Fi transmission mode configurations are considered separately for DSSS and OFDM. An initial test position is determined to reduce the number of tests required for certain exposure configurations with multiple test positions. An initial test configuration is determined for each frequency band and aggregated band according to maximum output power, channel bandwidth, wireless mode configurations and other operating parameters to streamline the measurement requirements. For 2.4 GHz DSSS, either the initial test position or DSSS procedure is applied to reduce the number of SAR tests; These are mutually exclusive. For OFDM, an initial test position is only applicable to next to the ear, UMPC mini-tablet and hotspot mode configurations, which is tested using the initial test configuration to facilitate test reduction. For other exposure conditions with a fixed test position, SAR test reduction is determined using only the initial test configuration.

The multiple test positions require SAR measurements in head, hotspot mode or UMPC mini-tablet configurations may be reduced according to the highest reported SAR determined using the *initial test position(s)* by applying the DSSS or OFDM SAR measurement procedures in the required wireless mode test configuration(s). The *initial test position(s)* is measured using the highest measured maximum output power channel in the required wireless mode test configuration(s). When the *reported SAR* for the *initial test position* is:

- ≤ 0.4 W/kg, further SAR measurement is not required for the other test positions in that exposure configuration and wireless mode combination within the frequency band or aggregated band. DSSS and OFDM configurations are considered separately according to the required SAR procedures.
- 0.4 W/kg, SAR is repeated using the same wireless mode test configuration tested in the *initial test position* to measure the subsequent next closet/smallest test separation distance and maximum coupling test position, on the highest maximum output power channel, until the *reported SAR* is ≤ 0.8 W/kg or all required test positions are tested.
 - ✧ For subsequent test positions with equivalent test separation distance or when exposure is dominated by coupling conditions, the position for maximum coupling condition should be tested.
 - ✧ When it is unclear, all equivalent conditions must be tested.
- For all positions/configurations tested using the *initial test position* and subsequent test positions, when the *reported SAR* is > 0.8 W/kg, measure the SAR for these positions/configurations on the subsequent next highest measured output power channel(s) until the *reported SAR* is ≤ 1.2 W/kg or all required test channels are considered.
 - ✧ The additional power measurements required for this step should be limited to those necessary for identifying subsequent highest output power channels to apply the test reduction.

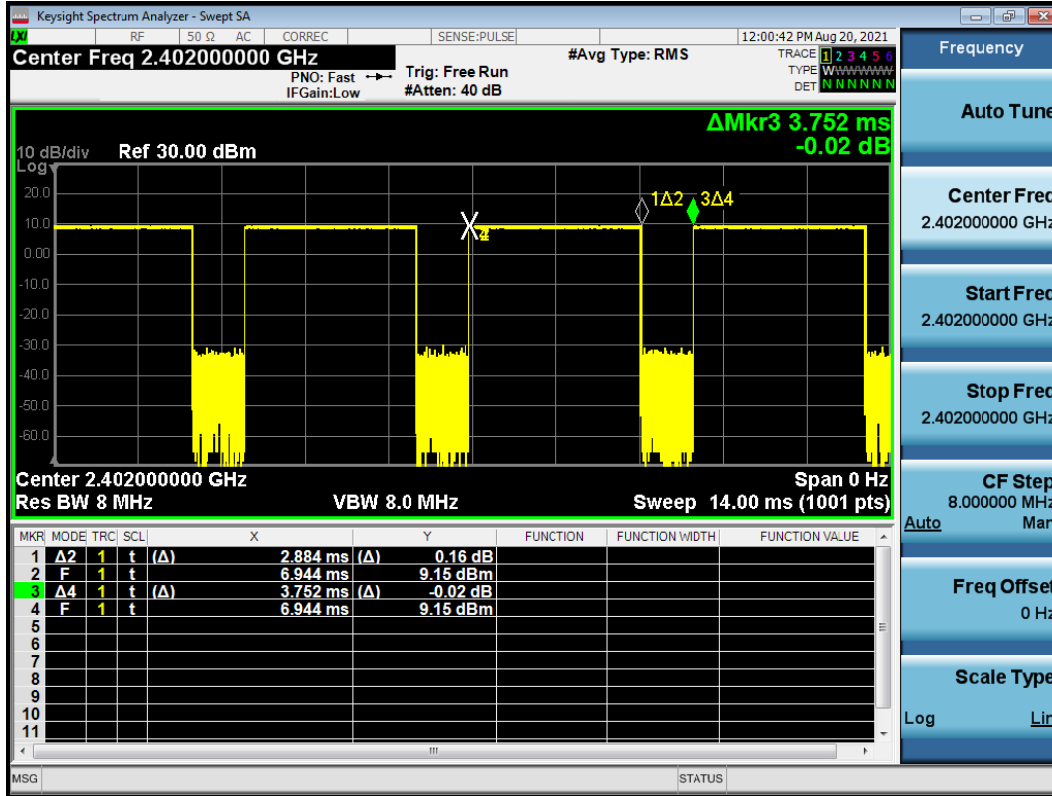
To determine the initial test position, Area Scans were performed to determine the position with the Maximum Value of SAR (measured). The position that produced the highest Maximum Value of SAR is considered the worst case position; thus used as the initial test position.

A Wi-Fi device must be configured to transmit continuously at the required data rate, channel bandwidth and signal modulation, using the highest transmission duty factor supported by the test mode tools for SAR measurement.

5.3.6 BT Test Configuration

For BT SAR testing, BT engineering testing software installed on the EUT can provide continuous transmitting RF signal with maximum output power. And the CBT control the EUT operating with hopping off and data rate set for DH5.

The SAR measurement takes full account of the BT duty cycle and is reflected in the report, and the duty factor of the device is as follow:

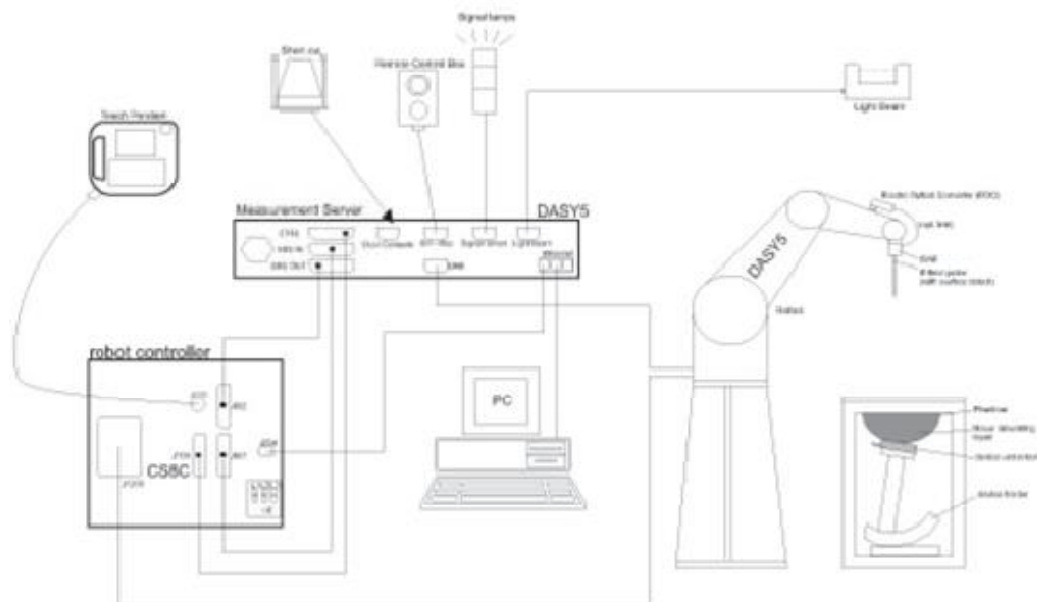


Note: Duty factor= Ton (ms)/ T(on+off) (ms)=2.884/3.752=77%

6 SAR Measurements System Configuration

6.1 SAR Measurement Set-up

The DASY system 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 WinXP or Win7 and the DASY 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.

6.2 DASY5 E-field Probe System

The SAR measurements were conducted with the dosimetric probe EX3DV4 (manufactured by SPEAG), designed in the classical triangular configuration and optimized for dosimetric evaluation.

EX3DV4 Probe Specification

Construction	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Calibration	ISO/IEC 17025 calibration service available
Frequency	10 MHz to > 6 GHz Linearity: ± 0.2 dB (30 MHz to 6 GHz)
Directivity	± 0.3 dB in HSL (rotation around probe axis) ± 0.5 dB in tissue material (rotation normal to probe axis)
Dynamic Range	10 μ W/g to > 100 mW/g Linearity: ± 0.2 dB (noise: typically < 1 μ W/g)
Dimensions	Overall length: 330 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). Only probe which enables compliance testing for frequencies up to 6 GHz with precision of better 30%.



E-field Probe Calibration

Each probe is calibrated according to a dosimetric assessment procedure with accuracy better than $\pm 10\%$. The spherical isotropy was evaluated and found to be better than ± 0.25 dB. The sensitivity parameters (NormX, NormY, NormZ), the diode compression parameter (DCP) and the conversion factor (ConvF) of the probe are tested.

The free space E-field from amplified probe outputs is determined in a test chamber. This is performed in a TEM cell for frequencies below 1 GHz, and in a wave guide above 1 GHz for free space. For the free space calibration, the probe is placed in the volumetric center of the cavity and at the proper orientation with the field. The probe is then rotated 360 degrees.

E-field temperature correlation calibration is performed in a flat phantom filled with the appropriate simulated brain tissue. The measured free space E-field in the medium correlates to temperature rise in a dielectric medium. For temperature correlation calibration a RF transparent thermistor-based temperature probe is used in conjunction with the E-field probe.



$$\text{SAR} = C \Delta T / \Delta t$$

Where: Δt = Exposure time (30 seconds),
 C = Heat capacity of tissue (brain or muscle),
 ΔT = Temperature increase due to RF exposure.

Or

$$\text{SAR} = |E|^2 \sigma / \rho$$

Where: σ = Simulated tissue conductivity,
 ρ = Tissue density (kg/m^3).

6.3 SAR Measurement Procedure

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.

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 dB) 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 D01 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	$\frac{1}{2} \cdot \delta \cdot \ln(2) \pm 0.5$ mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location	30° ± 1°	20° ± 1°
Maximum area scan spatial resolution: Δx_{Area} , Δy_{Area}	≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3 – 4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 10 mm
	When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	

Zoom Scan

Zoom scans are used 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 D01 SAR measurement 100 MHz to 6 GHz.

			≤3GHz	> 3 GHz
Maximum zoom scan spatial resolution: $\Delta x_{zoom} \Delta y_{zoom}$			≤2GHz: ≤8mm 2 – 3GHz: ≤5mm*	3 – 4GHz: ≤5mm* 4 – 6GHz: ≤4mm*
Maximum zoom scan spatial resolution, normal to phantom surface	Uniform grid: $\Delta z_{zoom}(n)$		≤5mm	3 – 4GHz: ≤4mm 4 – 5GHz: ≤3mm 5 – 6GHz: ≤2mm
	Graded grid	$\Delta z_{zoom}(1)$: between 1 st two points closest to phantom surface	≤4mm	3 – 4GHz: ≤3mm 4 – 5GHz: ≤2.5mm 5 – 6GHz: ≤2mm
		$\Delta z_{zoom}(n > 1)$: between subsequent points	≤1.5• $\Delta z_{zoom}(n-1)$	
Minimum zoom scan volume	X, y, z		≥30mm	3 – 4GHz: ≥28mm 4 – 5GHz: ≥25mm 5 – 6GHz: ≥22mm
<p>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.</p> <p>* When zoom scan is required and the <u>reported</u> SAR from the <i>area scan based 1-g SAR estimation</i> procedures of KDB 447498 is ≤ 1.4W/kg, ≤8mm, ≤7mm and ≤5mm zoom scan resolution may be applied, respectively, for 2GHz to 3GHz, 3GHz to 4GHz and 4GHz to 6GHz.</p>				

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.

Power Drift Monitoring

All SAR testing is under the EUT install full charged battery and transmit maximum output power. In DASYS 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.

7 Main Test Equipment

Name of Equipment	Manufacturer	Type/Model	Serial Number	Last Cal.	Cal. Due Date
Network analyzer	Agilent	E5071B	MY42404014	2021-05-15	2022-05-14
Dielectric Probe Kit	HP	85070E	US44020115	2021-05-15	2022-05-14
Power meter	Agilent	E4417A	GB41291714	2021-05-15	2022-05-14
Power sensor	Agilent	N8481H	MY50350004	2021-05-15	2022-05-14
Power sensor	Agilent	E9327A	US40441622	2021-05-15	2022-05-14
Dual directional coupler	Agilent	778D-012	50519	/	/
Dual directional coupler	Agilent	777D	50146	/	/
Dual directional coupler	UCL	UCL-DDC0 56G-S	20010600118	/	/
Amplifier	INDEXSAR	TPA-005060 G01	13030502	2021-05-15	2022-05-14
Wireless communication tester	Anritsu	MT8820C	6201342015	2020-12-13	2021-12-12
Wideband radio communication tester	R&S	CMW 500	113645	2021-05-15	2022-05-14
Base Station Simulator	R&S	CMW27	100673	2021-05-15	2022-05-14
E-field Probe	SPEAG	EX3DV4	7628	2021-02-16	2022-02-15
DAE	SPEAG	DAE4	1317	2021-02-23	2022-02-22
Validation Kit 1750MHz	SPEAG	D1750V2	1033	2020-02-25	2023-02-24
Validation Kit 1900MHz	SPEAG	D1900V2	5d060	2020-08-27	2023-08-26
Validation Kit 2450MHz	SPEAG	D2450V2	786	2020-08-27	2023-08-26
Validation Kit 2600MHz	SPEAG	D2600V2	1025	2021-04-23	2024-04-22
Validation Kit 5GHz	SPEAG	D5GHzV2	1151	2020-02-27	2023-02-26
Temperature Probe	Tianjin jinming	JM222	381	2021-05-15	2022-05-14
Hygrothermograph	Anymetr	HTC - 1	TY2020A001	2021-05-15	2022-05-14
Twin SAM Phantom	Speag	SAM1	1534	/	/
Software for Test	Speag	DASY52	/	/	/
Softwarefor Tissue	Agilent	85070	/	/	/

8 Tissue Dielectric Parameter Measurements & System Verification

8.1 Tissue Verification

The temperature of the tissue-equivalent medium used during measurement must also be within 18°C to 25°C and within ± 2°C of the temperature when the tissue parameters are characterized. The dielectric parameters must be measured before the tissue-equivalent medium is used in a series of SAR measurements. The parameters should be re-measured after each 24 hours of use; or earlier if the dielectric parameters can become out of tolerance.

Target values

Frequency (MHz)	Water (%)	Salt (%)	Sugar (%)	Glycol (%)	Preventol (%)	Cellulose (%)	ϵ_r	σ (s/m)
1750	55.24	0.31	0	44.45	0	0	40.1	1.37
1900	55.242	0.306	0	44.452	0	0	40.0	1.40
2450	62.7	0.5	0	36.8	0	0	39.2	1.80
2600	55.242	0.306	0	44.452	0	0	39.0	1.96
Frequency (MHz)	Water (%)	Diethylenglycol monohexylether			Triton X-100		ϵ_r	σ (s/m)
5250	65.53	17.24			17.23		35.9	4.71
5600	65.53	17.24			17.23		35.5	5.07

Measurements results

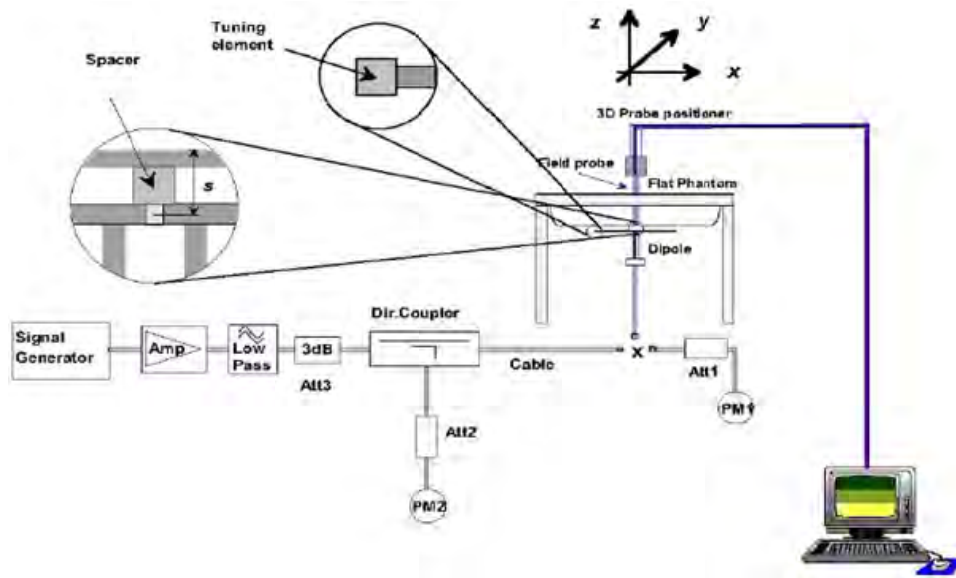
Frequency (MHz)	Test Date	Temp °C	Measured Dielectric Parameters		Target Dielectric Parameters		Limit (Within ±5%)	
			ϵ_r	σ (s/m)	ϵ_r	σ (s/m)	Dev ϵ_r (%)	Dev σ (%)
1750	8/19/2021	21.5	40.1	1.34	40.1	1.37	0.00	-2.19
1900	8/20/2021	21.5	40.0	1.40	40.0	1.40	0.00	0.00
2450	8/21/2021	21.5	38.6	1.81	39.2	1.80	-1.53	0.56
2600	8/19/2021	21.5	38.2	1.96	39.0	1.96	-2.05	0.00
5250	9/4/2021	21.5	35.5	4.80	35.9	4.71	-1.11	1.91
5600	9/4/2021	21.5	34.2	5.21	35.5	5.07	-3.66	2.76

Note: The depth of tissue-equivalent liquid in a phantom must be ≥ 15.0 cm for SAR measurements ≤ 3 GHz and ≥ 10.0 cm for measurements > 3 GHz.

8.2 System Performance Check

The manufacturer calibrates the probes annually. Dielectric parameters of the tissue simulates were measured using the dielectric probe kit and the network analyzer. A system check measurement for every day was made following the determination of the dielectric parameters of the Tissue simulates, using the dipole validation kit. The dipole antenna was placed under the flat section of the twin SAM phantom.

System check is performed regularly on all frequency bands where tests are performed with the DASY system.



Picture 1 System Performance Check setup



Picture 2 Setup Photo

**Justification for Extended SAR Dipole Calibrations**

Usage of SAR dipoles calibrated less than 3 years ago but more than 1 year ago were confirmed in maintaining return loss (< -20 dB, within 20% of prior calibration) and impedance (within 5 ohm from prior calibration) requirements per extended calibrations in KDB 865664 D01:

Dipole		Date of Measurement	Return Loss(dB)	Δ %	Impedance (Ω)	$\Delta\Omega$
Dipole D1750V2 SN: 1033	Head Liquid	2/25/2020	-38.3	/	48.8	/
		2/26/2021	-40.0	-1.7	49.9	1.1
Dipole D5GHzV2 SN: 1151 (5250MHz)	Head Liquid	2/27/2020	-23.4	/	52.4	/
		2/26/2021	-23.8	-0.4	50.0	-2.4
Dipole D5GHzV2 SN: 1151 (5600MHz)	Head Liquid	2/27/2020	-22.6	/	57.0	/
		2/26/2021	-21.5	1.1	55.6	-1.4
Dipole D5GHzV2 SN: 1151 (5750MHz)	Head Liquid	2/27/2020	-25.0	/	55.9	/
		2/26/2021	-26.8	-1.8	52.5	-3.4

System Check results

Frequency (MHz)	Test Date	Temp $^{\circ}\text{C}$	250mW /100mW Measured SAR_{1g} (W/kg)	1W Normalized SAR_{1g} (W/kg)	1W Target SAR_{1g} (W/kg)	Δ % (Limit $\pm 10\%$)	Plot No.
1750	8/19/2021	21.5	9.11	36.44	35.90	1.50	1
1900	8/20/2021	21.5	10.55	42.20	39.50	6.84	2
2450	8/21/2021	21.5	13.70	54.80	52.30	4.78	3
2600	8/19/2021	21.5	13.90	55.60	56.10	-0.89	4
5250	9/4/2021	21.5	7.87	78.70	78.00	0.90	5
5600	9/4/2021	21.5	7.67	76.70	80.50	-4.72	6

Note: Target Values used derive from the calibration certificate Data Storage and Evaluation.

8.3 SAR System Validation

Per FCC KDB 865664 D02v01, SAR system verification is required to confirm measurement accuracy. The SAR systems (including SAR probes, system components and software versions) used for this device were validated against its performance specifications prior to the SAR measurements. Reference dipoles are used with the required tissue-equivalent media for system validation, according to the procedures outlined in FCC KDB 865664 D01 and IEEE 1528-2013. Since SAR probe calibrations are frequency dependent, each probe calibration point must be validated at a frequency within the valid frequency range of the probe calibration point, using the system that normally operates with the probe for routine SAR measurements and according to the required tissue-equivalent media.

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

Frequency [MHz]	Date	Probe SN	Probe Type	Probe Cal Point		PERM (Er)	COND (Σ)	CW Validation			Mod. Validation		
								Sensitivity	Probe Linearity	Probe Isotropy	Mod. Type	Duty Factor	PAR
1750	2/16/2021	7628	EX3DV4	1750	Head	39.91	1.32	PASS	PASS	PASS	NA	N/A	N/A
1900	2/16/2021	7628	EX3DV4	1900	Head	39.43	1.42	PASS	PASS	PASS	GMSK	PASS	N/A
2450	2/16/2021	7628	EX3DV4	2450	Head	38.19	1.83	PASS	PASS	PASS	OFDM	PASS	PASS
2600	2/16/2021	7628	EX3DV4	2600	Head	37.60	1.99	PASS	PASS	PASS	TDD	PASS	N/A
5250	2/16/2021	7628	EX3DV4	5250	Head	35.36	4.83	PASS	PASS	PASS	OFDM	N/A	PASS
5600	2/16/2021	7628	EX3DV4	5600	Head	34.43	5.29	PASS	PASS	PASS	OFDM	N/A	PASS

NOTE: While the probes have been calibrated for both CW and modulated signals, all measurements were performed using communication systems calibrated for CW signals only. Modulations in the table above represent test configurations for which the measurement system has been validated per FCC KDB Publication 865664D01v01 for scenarios when CW probe calibrations are used with other signal types. SAR systems were validated for modulated signals with a periodic duty cycle, such as GMSK, or with a high peak to average ratio (>5dB), such as OFDM according to KDB 865664.

9 Normal and Maximum Output Power

KDB 447498 D01 at the maximum rated output power and within the tune-up tolerance range specified for the product, but not more than 2 dB lower than the maximum tune-up tolerance limit.

9.1 GSM Mode

GSM 1900		Burst-Averaged output power(dBm)				Division Factors	Frame-Averaged output power(dBm)			
		Tune-up	Channel/Frenqucy(MHz)				Tune-up	Channel/Frenqucy(MHz)		
		MAX	512 /1850.2	661 /1880	810 /1909.8		MAX	512 /1850.2	661 /1880	810 /1909.8
GSM	CS	32.00	31.15	31.23	31.35	9.03	22.97	22.12	22.20	22.32
GPRS/EGPRS (GMSK)	1 Tx Slot	32.00	31.23	31.23	31.36	9.03	22.97	22.20	22.20	22.33
	2 Tx Slots	31.00	30.18	30.11	30.26	6.02	24.98	24.16	24.09	24.24
	3 Tx Slots	29.00	27.92	27.74	27.87	4.26	24.74	23.66	23.48	23.61
	4 Tx Slots	27.50	26.62	26.48	26.53	3.01	24.49	23.61	23.47	23.52
EGPRS (8PSK)	1 Tx Slot	27.50	26.60	26.70	26.42	9.03	18.47	17.57	17.67	17.39
	2 Tx Slots	26.50	25.31	25.30	25.41	6.02	20.48	19.29	19.28	19.39
	3 Tx Slots	24.50	23.17	23.92	23.33	4.26	20.24	18.91	19.66	19.07
	4 Tx Slots	22.50	21.53	22.10	21.80	3.01	19.49	18.52	19.09	18.79

Notes: The worst-case configuration and mode for SAR testing is determined to be as follows:

1. Standalone: GSM 1900 GMSK (GPRS) mode with 2 time slots for Max power, based on the output power measurements above.

9.2 WCDMA Mode

The following tests were completed according to the test requirements outlined in the 3GPP TS34.121 specification.

WCDMA		Band II(dBm)				Band IV(dBm)			
Tx Channel		9262	9400	9538	Tune-up	1312	1413	1513	Tune-up
Frequency(MHz)		1852.4	1880	1907.6	Limit	1712.4	1732.6	1752.6	Limit
RMC	12.2kbps	23.16	23.13	23.17	24.00	23.17	23.18	23.14	24.00
AMR	12.2kbps	23.04	23.15	23.27	24.00	23.11	23.24	23.08	24.00
HSDPA	Sub 1	22.68	22.49	22.55	23.50	22.61	22.78	22.76	23.50
	Sub 2	22.76	22.75	22.53	23.50	22.65	22.78	22.62	23.50
	Sub 3	22.32	22.21	22.33	23.00	22.07	22.34	22.18	23.00
	Sub 4	22.00	22.09	22.33	23.00	22.33	22.26	22.10	23.00
HSUPA	Sub 1	22.80	22.77	22.77	23.50	22.75	22.60	22.56	23.50
	Sub 2	21.76	21.79	21.61	22.50	21.55	21.60	21.50	22.50
	Sub 3	21.52	21.63	21.65	22.50	21.77	21.68	21.56	22.50
	Sub 4	20.54	20.77	20.63	21.50	20.83	20.74	20.72	21.50
	Sub 5	22.60	22.75	22.65	23.50	22.63	22.82	22.74	23.50
HSPA+	16QAM	22.48	22.37	22.21	23.00	22.23	22.38	22.42	23.00

Note: 1.Per KDB 941225 D01, SAR for each exposure is measured using a 12.2 kbps RMC with TPC bits configured to all "1's".

9.3 LTE Mode

UE Power Class: 3 (23 +/- 2dBm). The allowed Maximum Power Reduction (MPR) for the maximum output power due to higher order modulation and transmit bandwidth configuration (resource blocks) is specified in Table 6.2.3-1 of the 3GPP TS36.101.

Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 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
64 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 2
64 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 3

LTE FDD Band 2				Maximum Output Power (dBm)			Tune-up Limit	
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)				
				18607/1850.7	18900/1880	19193/1909.3		
1.4MHz	QPSK	1	0	23.18	23.22	23.34	24.00	
		1	2	23.21	23.32	23.20	24.00	
		1	5	23.05	23.03	23.16	24.00	
		3	0	23.22	23.46	23.37	24.00	
		3	2	23.30	23.41	23.40	24.00	
		3	3	23.27	23.41	23.18	24.00	
	16QAM	6	0	22.27	22.49	22.33	23.00	
		1	0	22.15	22.75	22.80	23.00	
		1	2	22.13	22.17	22.20	23.00	
		1	5	22.40	22.43	22.49	23.00	
		3	0	22.44	22.41	22.49	23.00	
		3	2	22.34	22.37	22.44	23.00	
	64QAM	3	3	22.26	22.32	22.33	23.00	
		6	0	21.38	21.44	21.48	22.00	
		1	0	21.71	21.33	21.10	22.00	
		1	2	21.76	21.33	21.20	22.00	
		1	5	21.54	21.15	21.16	22.00	
		3	0	21.28	21.41	21.24	22.00	
		3	2	21.23	21.43	21.27	22.00	
		3	3	21.42	21.33	21.17	22.00	
		6	0	20.42	20.47	20.22	21.00	
Bandwidth		Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit
3MHz		QPSK			18615/1851.5	18900/1880	19185/1908.5	
3MHz		QPSK	1	0	23.20	23.26	23.37	24.00
	1		7	23.19	23.35	23.24	24.00	
	1		14	23.08	23.08	23.20	24.00	



		8	0	22.32	22.58	22.50	23.00	
		8	4	22.42	22.51	22.52	23.00	
		8	7	22.37	22.52	22.28	23.00	
		15	0	22.27	22.53	22.36	23.00	
	16QAM	1	0	22.18	22.77	22.83	23.00	
		1	7	22.16	22.17	22.24	23.00	
		1	14	22.42	22.47	22.52	23.00	
		8	0	21.55	21.54	21.61	22.00	
		8	4	21.45	21.50	21.56	22.00	
		8	7	21.36	21.44	21.46	22.00	
		15	0	21.41	21.48	21.51	22.00	
	64QAM	1	0	21.73	21.37	21.13	22.00	
		1	7	21.74	21.36	21.24	22.00	
		1	14	21.57	21.20	21.20	22.00	
		8	0	20.38	20.53	20.37	21.00	
		8	4	20.35	20.53	20.39	21.00	
		8	7	20.52	20.44	20.27	21.00	
		15	0	20.42	20.51	20.25	21.00	
	Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit
					18625/1852.5	18900/1880	19175/1907.5	
	5MHz	QPSK	1	0	23.17	23.24	23.33	24.00
1			13	23.17	23.31	23.21	24.00	
1			24	23.05	23.03	23.16	24.00	
12			0	22.29	22.53	22.46	23.00	
12			6	22.40	22.47	22.47	23.00	
12			13	22.35	22.50	22.24	23.00	
25			0	22.27	22.52	22.34	23.00	
16QAM		1	0	22.15	22.73	22.80	23.00	
		1	13	22.13	22.15	22.21	23.00	
		1	24	22.39	22.45	22.48	23.00	
		12	0	21.53	21.50	21.58	22.00	
		12	6	21.42	21.45	21.52	22.00	
		12	13	21.33	21.39	21.42	22.00	
		25	0	21.39	21.44	21.46	22.00	
64QAM		1	0	21.70	21.35	21.09	22.00	
		1	13	21.72	21.32	21.21	22.00	
		1	24	21.54	21.15	21.16	22.00	
		12	0	20.35	20.48	20.33	21.00	
		12	6	20.33	20.49	20.34	21.00	
		12	13	20.50	20.42	20.23	21.00	
		25	0	20.42	20.50	20.23	21.00	
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit	
				18650/1855	18900/1880	19150/1905		



10MHz	QPSK	1	0	23.19	23.25	23.36	24.00
		1	25	23.20	23.36	23.25	24.00
		1	49	23.07	23.07	23.19	24.00
		25	0	22.32	22.58	22.50	23.00
		25	13	22.43	22.52	22.51	23.00
		25	25	22.37	22.54	22.29	23.00
		50	0	22.31	22.54	22.38	23.00
	16QAM	1	0	22.17	22.76	22.82	23.00
		1	25	22.16	22.19	22.24	23.00
		1	49	22.42	22.47	22.51	23.00
		25	0	21.56	21.55	21.62	22.00
		25	13	21.44	21.49	21.55	22.00
		25	25	21.36	21.44	21.46	22.00
		50	0	21.42	21.49	21.50	22.00
	64QAM	1	0	21.72	21.36	21.12	22.00
		1	25	21.75	21.37	21.25	22.00
		1	49	21.56	21.19	21.19	22.00
		25	0	20.38	20.53	20.37	21.00
		25	13	20.36	20.54	20.38	21.00
		25	25	20.52	20.46	20.28	21.00
		50	0	20.46	20.52	20.27	21.00
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit
				18675/1857.5	18900/1880	19125/1902.5	
15MHz	QPSK	1	0	23.18	23.21	23.34	24.00
		1	38	23.18	23.35	23.22	24.00
		1	74	23.04	23.02	23.15	24.00
		36	0	22.30	22.54	22.47	23.00
		36	18	22.40	22.47	22.47	23.00
		36	39	22.34	22.51	22.25	23.00
		75	0	22.29	22.50	22.33	23.00
	16QAM	1	0	22.12	22.74	22.80	23.00
		1	38	22.14	22.16	22.22	23.00
		1	74	22.39	22.43	22.48	23.00
		36	0	21.53	21.53	21.59	22.00
		36	18	21.41	21.44	21.51	22.00
		36	39	21.34	21.40	21.43	22.00
		75	0	21.39	21.44	21.46	22.00
	64QAM	1	0	21.71	21.32	21.10	22.00
		1	38	21.73	21.36	21.22	22.00
		1	74	21.53	21.14	21.15	22.00
		36	0	20.36	20.49	20.34	21.00
		36	18	20.33	20.49	20.34	21.00
		36	39	20.49	20.43	20.24	21.00



Bandwidth	Modulation	75	0	20.44	20.48	20.22	21.00
		RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit
				18700/1860	18900/1880	19100/1900	
20MHz	QPSK	1	0	23.15	23.17	23.31	24.00
		1	50	23.17	23.31	23.20	24.00
		1	99	23.02	23.01	23.12	24.00
		50	0	22.27	22.49	22.43	23.00
		50	25	22.38	22.43	22.44	23.00
		50	50	22.31	22.46	22.21	23.00
		100	0	22.26	22.45	22.29	23.00
	16QAM	1	0	22.65	22.70	22.75	23.00
		1	50	22.10	22.14	22.18	23.00
		1	99	22.37	22.40	22.46	23.00
		50	0	21.50	21.49	21.56	22.00
		50	25	21.38	21.42	21.48	22.00
		50	50	21.31	21.35	21.39	22.00
		100	0	21.37	21.40	21.43	22.00
	64QAM	1	0	21.68	21.28	21.07	22.00
		1	50	21.72	21.32	21.20	22.00
		1	99	21.51	21.13	21.12	22.00
		50	0	20.33	20.44	20.30	21.00
		50	25	20.31	20.45	20.31	21.00
		50	50	20.46	20.38	20.20	21.00
		100	0	20.41	20.43	20.18	21.00

LTE TDD Band 41				Maximum Output Power (dBm)					Tune-up Limit
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency(MHz)					
				39675/ 2498.5	40148/ 2545.8	40620/ 2593	41093/ 2640.3	41565/ 2687.5	
5MHz	QPSK	1	0	23.17	23.13	22.89	23.01	23.16	24.00
		1	13	23.36	23.22	23.08	23.18	23.29	24.00
		1	24	23.41	23.11	23.06	23.08	23.12	24.00
		12	0	22.30	22.21	21.98	22.20	22.34	23.00
		12	6	22.41	22.22	22.14	22.15	22.30	23.00
		12	13	22.56	22.15	22.20	22.15	22.18	23.00
		25	0	22.42	22.23	22.13	22.22	22.25	23.00
	16QAM	1	0	22.16	21.71	21.80	21.76	21.85	23.00
		1	13	22.15	21.97	22.09	22.01	22.13	23.00
		1	24	22.07	21.97	22.02	22.03	22.08	23.00
		12	0	21.19	21.19	21.13	21.26	21.20	22.00
		12	6	21.33	21.18	21.27	21.24	21.33	22.00
		12	13	21.23	21.26	21.18	21.30	21.22	22.00
		25	0	21.31	21.29	21.26	21.32	21.29	22.00



Bandwidth	Modulation	RB allocation	offset	Channel/Frequency(MHz)					Tune-up Limit
				39700/2501	40160/2547	40620/2593	41080/2639	41540/2685	
10MHz	64QAM	1	0	21.22	20.98	21.30	21.13	21.36	22.00
		1	13	21.42	21.13	21.60	21.31	21.52	22.00
		1	24	21.42	21.17	21.62	21.28	21.36	22.00
		12	0	20.55	20.13	20.68	20.34	20.69	21.00
		12	6	20.53	20.13	20.67	20.32	20.69	21.00
		12	13	20.87	20.46	20.85	20.60	20.65	21.00
		25	0	20.61	20.28	20.80	20.48	20.73	21.00
10MHz	QPSK	1	0	23.16	23.09	22.87	22.97	23.14	24.00
		1	25	23.34	23.21	23.05	23.17	23.26	24.00
		1	49	23.38	23.06	23.02	23.03	23.08	24.00
		25	0	22.28	22.17	21.95	22.16	22.31	23.00
		25	13	22.38	22.17	22.10	22.10	22.26	23.00
		25	25	22.53	22.12	22.16	22.12	22.14	23.00
		50	0	22.40	22.19	22.08	22.18	22.20	23.00
	16QAM	1	0	22.11	21.69	21.78	21.74	21.83	23.00
		1	25	22.13	21.94	22.07	21.98	22.11	23.00
		1	49	22.04	21.93	21.99	21.99	22.05	23.00
		25	0	21.16	21.17	21.10	21.24	21.17	22.00
		25	13	21.30	21.13	21.23	21.19	21.29	22.00
		25	25	21.21	21.22	21.15	21.26	21.19	22.00
		50	0	21.28	21.24	21.22	21.27	21.25	22.00
	64QAM	1	0	21.21	20.94	21.28	21.12	21.32	22.00
		1	25	21.40	21.12	21.57	21.29	21.51	22.00
		1	49	21.39	21.12	21.58	21.25	21.31	22.00
		25	0	20.53	20.09	20.65	20.32	20.65	21.00
		25	13	20.50	20.08	20.63	20.29	20.64	21.00
		25	25	20.84	20.43	20.81	20.57	20.62	21.00
		50	0	20.59	20.24	20.75	20.46	20.69	21.00
20MHz	QPSK	1	0	23.13	23.05	22.84	22.93	23.11	24.00
		1	50	23.33	23.17	23.03	23.13	23.24	24.00
1		99	23.36	23.05	22.99	23.02	23.05	24.00	
50		0	22.25	22.12	21.91	22.11	22.27	23.00	
50		25	22.36	22.13	22.07	22.06	22.23	23.00	
50		50	22.50	22.07	22.12	22.07	22.10	23.00	
100		0	22.37	22.14	22.04	22.13	22.16	23.00	
16QAM	1	0	21.80	21.65	21.73	21.70	21.78	23.00	
	1	50	22.09	21.92	22.03	21.96	22.07	23.00	
	1	99	22.02	21.90	21.97	21.96	22.03	23.00	
	50	0	21.13	21.13	21.07	21.20	21.14	22.00	



		50	25	21.27	21.11	21.20	21.17	21.26	22.00
		50	50	21.18	21.17	21.11	21.21	21.15	22.00
		100	0	21.26	21.20	21.19	21.23	21.22	22.00
	64QAM	1	0	21.18	20.90	21.25	21.09	21.28	22.00
		1	50	21.39	21.08	21.55	21.28	21.47	22.00
		1	99	21.37	21.11	21.55	21.23	21.30	22.00
		50	0	20.50	20.04	20.61	20.29	20.60	21.00
		50	25	20.48	20.04	20.60	20.27	20.60	21.00
		50	50	20.81	20.38	20.77	20.54	20.57	21.00
		100	0	20.56	20.19	20.71	20.43	20.64	21.00

9.4 WLAN Mode

Wi-Fi 2.4G Mode	Channel /Frequency(MHz)	Maximum Output Power (dBm)	
		Tune-up	Meas.
802.11b (1M)	1/2412	19.00	18.12
	6/2437	19.00	18.51
	11/2462	19.00	18.27
802.11g (6M)	1/2412	15.00	14.06
	6/2437	15.00	14.46
	11/2462	15.00	14.37
802.11n-HT20 (MCS0)	1/2412	15.00	13.95
	6/2437	15.00	14.37
	11/2462	15.00	14.24
802.11n-HT40 (MCS0)	3/2422	12.00	11.04
	6/2437	12.00	11.33
	9/2452	12.00	11.26

Note: Initial test configuration is 802.11b mode.

Wi-Fi 5G (U-NII-1) Mode	Channel /Frequency(MHz)	Maximum Output Power (dBm)	
		Tune-up	Meas.
802.11a (6M)	36/5180	15.50	14.04
	40/5200	15.50	14.38
	44/5220	15.50	14.21
	48/5240	15.50	13.96
802.11n-HT20 (MCS0)	36/5180	15.50	14.10
	40/5200	15.50	14.54
	44/5220	15.50	14.62
	48/5240	15.50	14.95
802.11n-HT40 (MCS0)	38/5190	15.50	14.25
	46/5230	15.50	14.51
802.11ac-VHT20 (MCS0)	36/5180	10.00	8.19
	40/5200	10.00	8.54
	44/5220	10.00	8.26
	48/5240	10.00	8.13
802.11ac-VHT40 (MCS0)	38/5190	10.00	8.39
	46/5230	10.00	8.37
802.11ac-VHT80	42/5210	10.00	8.19



(MCS0)			
Note. Initial test configuration is 802.11n-HT20 mode, since the highest maximum output power.			

Wi-Fi 5G (U-NII-2A)	Channel /Frequency(MHz)	Maximum Output Power (dBm)	
		Tune-up	Meas.
Mode			
802.11a (6M)	52/5260	15.50	14.15
	56/5280	15.50	14.47
	60/5300	15.50	14.60
	64/5320	15.50	14.72
802.11n-HT20 (MCS0)	52/5260	15.50	14.17
	56/5280	15.50	14.38
	60/5300	15.50	14.29
	64/5320	15.50	14.69
802.11n-HT40 (MCS0)	54/5270	15.50	14.51
	62/5310	15.50	14.08
802.11ac-VHT20 (MCS0)	52/5260	10.00	8.29
	56/5280	10.00	8.54
	60/5300	10.00	8.39
	64/5320	10.00	8.47
802.11ac-VHT40 (MCS0)	54/5270	10.00	8.49
	62/5310	10.00	8.68
802.11ac-VHT80 (MCS0)	58/5290	10.00	8.86

Note. Initial test configuration is 802.11a mode, since the highest maximum output power.

Wi-Fi 5G (U-NII-2C)	Channel /Frequency(MHz)	Maximum Output Power (dBm)	
		Tune-up	Meas.
Mode			
802.11a (6M)	100/5500	15.50	14.81
	116/5580	15.50	14.68
	140/5700	15.50	14.09
	144/5720	15.50	14.52
802.11n-HT20 (MCS0)	100/5500	15.50	14.68
	116/5580	15.50	14.49
	140/5700	15.50	14.10
	144/5720	15.50	14.07
802.11n-HT40 (MCS0)	102/5510	14.50	12.66
	110/5550	15.50	14.70
	134/5670	15.50	14.20



	142/5710	15.50	14.49
802.11ac-VHT20 (MCS0)	100/5500	10.00	8.76
	116/5580	10.00	8.54
	140/5700	10.00	8.12
	144/5720	10.00	8.51
802.11ac-VHT40 (MCS0)	102/5510	10.00	8.57
	110/5550	10.00	8.67
	134/5670	10.00	8.14
	142/5710	10.00	8.43
802.11ac-VHT80 (MCS0)	106/5530	10.00	8.69
	138/5690	10.00	8.43

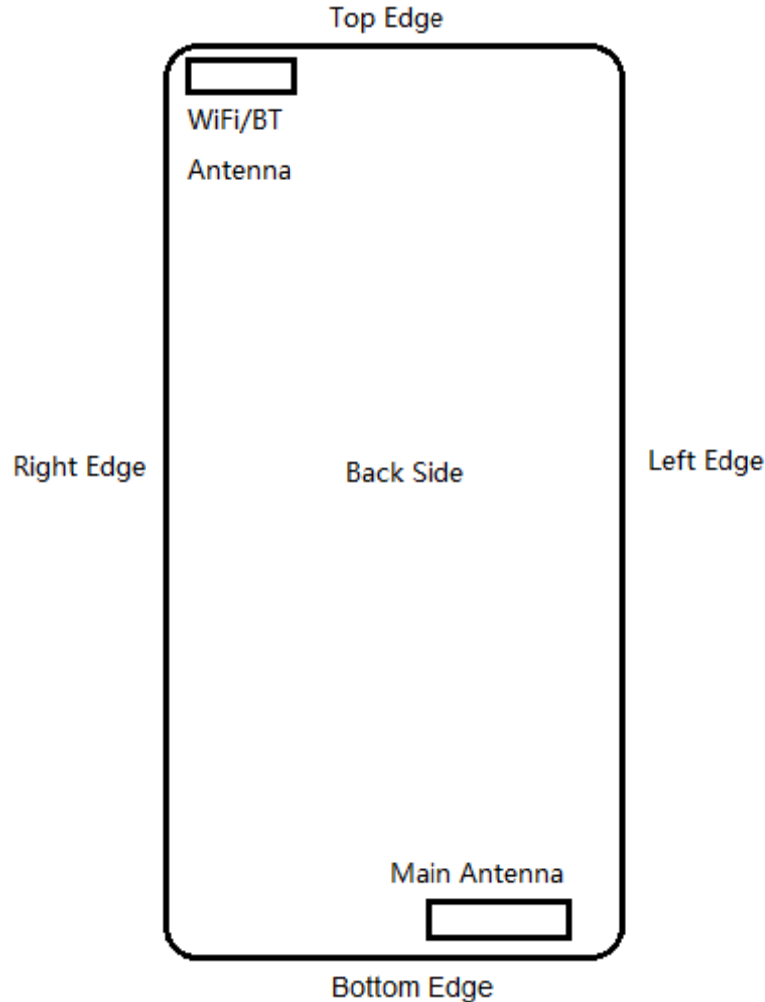
Note. Initial test configuration is 802.11a mode, since the highest maximum output power.

9.5 Bluetooth Mode

BT	Conducted Power(dBm)			Tune-up Limit (dBm)
	Channel/Frequency(MHz)			
	Ch 0/2402 MHz	Ch 39/2441 MHz	Ch 78/2480 MHz	
GFSK	9.33	9.81	9.65	10.50
$\pi/4$ DQPSK	8.56	9.14	8.90	10.50
8DPSK	8.33	8.87	8.77	10.50
BLE	Ch 0/2402 MHz	Ch 19/2440 MHz	Ch 39/2480 MHz	Tune-up Limit (dBm)
GFSK(1M)	3.14	3.97	3.11	5.00
GFSK(2M)	1.31	2.14	1.33	5.00

10 Measured and Reported (Scaled) SAR Results

10.1 EUT Antenna Locations



Overall (Length x Width): 168 mm x 79 mm						
Overall Diagonal: 179mm/Display Diagonal: 165mm						
Distance of the Antenna to the EUT surface/edge						
Antenna	Back Side	Front side	Left Edge	Right Edge	Top Edge	Bottom Edge
Main-Antenna	<25mm	<25mm	<25mm	<25mm	>25mm	<25mm
BT/Wi-Fi Antenna	<25mm	<25mm	>25mm	<25mm	<25mm	>25mm
Hotspot mode, Positions for SAR tests						
Mode	Back Side	Front side	Left Edge	Right Edge	Top Edge	Bottom Edge
Main-Antenna	Yes	Yes	Yes	Yes	N/A	Yes
BT/Wi-Fi Antenna	Yes	Yes	N/A	Yes	Yes	N/A

Note: 1. Per KDB 941225 D06, when the overall device length and width are $\geq 9\text{cm} \times 5\text{cm}$, the test distance is 10mm. SAR must be measured for all sides and surfaces with a transmitting antenna located within 25mm from that surface or edge.

2. For smart phones with an overall diagonal dimension is 179mm. Per KDB 648474 D04, for smart phones with a



display diagonal dimension > 15.0 cm or an overall diagonal dimension > 16.0 cm, product specific 10-g SAR must be tested as a phablet to determine SAR compliance. For Phablet, Since hotspot mode 1-g *reported* SAR < 1.2 W/kg, product specific 10-g SAR is no required.

3. Per FCC KDB 447498 D01, for each exposure position, testing of other required channels within the operating mode of a frequency band is not required when the reported 1-g or 10-g SAR for the mid-band or highest output power channel is:

- a) ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
- b) ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz.
- c) ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz.

4. When the original highest measured SAR is ≥ 0.80 W/kg, the measurement was repeated once.

5. Per FCC KDB Publication 648474 D04, SAR was evaluated without a headset connected to the device. Since the reported SAR was ≤ 1.2 W/kg, no additional SAR evaluations using a headset cable were required.

10.2 Measured SAR Results

Note: 1. The value with blue color is the maximum SAR Value of each test band.

2. For GSM, when multiple slots are used, SAR should be tested to account for the maximum source-based time-averaged output power.

3. For WCDMA, When the maximum output power and tune-up tolerance specified for production units in a secondary mode is $\leq \frac{1}{4}$ dB higher than the primary mode or when the highest reported SAR of the primary mode is scaled by the ratio of specified maximum output power and tune-up tolerance of secondary to primary mode and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for the secondary mode.

4. For LTE, QPSK with 100% RB allocation, SAR is required when and the highest reported SAR for 1 RB and 50% RB allocation in are $\geq 50\%$ limit(1g).

Head

Band	Test Position	Dist. (mm)	Mode	RB	offset	Ch./Freq. (MHz)	Tune-up (dBm)	Measured power (dBm)	Measured SAR1g	Power Drift (dB)	Scaling Factor	Report SAR1g	Plot No.
GSM 1900	Left cheek	0	GSM	-	-	661/1880	32.00	31.23	0.092	-0.022	1.19	0.110	7
	Left Tilt	0	GSM	-	-	661/1880	32.00	31.23	0.048	0.060	1.19	0.058	/
	Right cheek	0	GSM	-	-	661/1880	32.00	31.23	0.070	0.030	1.19	0.084	/
	Right Tilt	0	GSM	-	-	661/1880	32.00	31.23	0.050	-0.140	1.19	0.060	/
WCDMA II	Left cheek	0	RMC 12.2K	-	-	9400/1880	24.00	23.13	0.152	0.020	1.22	0.186	8
	Left Tilt	0	RMC 12.2K	-	-	9400/1880	24.00	23.13	0.065	-0.110	1.22	0.079	/
	Right cheek	0	RMC 12.2K	-	-	9400/1880	24.00	23.13	0.107	0.035	1.22	0.131	/
	Right Tilt	0	RMC 12.2K	-	-	9400/1880	24.00	23.13	0.064	-0.180	1.22	0.078	/
WCDMA IV	Left cheek	0	RMC 12.2K	-	-	1413/1732.6	24.00	23.18	0.093	-0.170	1.21	0.112	/
	Left Tilt	0	RMC 12.2K	-	-	1413/1732.6	24.00	23.18	0.088	0.130	1.21	0.107	/
	Right cheek	0	RMC 12.2K	-	-	1413/1732.6	24.00	23.18	0.136	0.048	1.21	0.164	9
	Right Tilt	0	RMC 12.2K	-	-	1413/1732.6	24.00	23.18	0.054	-0.090	1.21	0.065	/
LTE 2	Left cheek	0	QPSK	1	50	18900/1880	24.00	23.31	0.101	-0.080	1.17	0.118	10
		0	QPSK	50%	0	18900/1880	24.00	22.49	0.083	0.155	1.42	0.117	/
	Left Tilt	0	QPSK	1	50	18900/1880	24.00	23.31	0.040	0.112	1.17	0.047	/
		0	QPSK	50%	0	18900/1880	24.00	22.49	0.030	0.032	1.42	0.043	/
	Right cheek	0	QPSK	1	50	18900/1880	24.00	23.31	0.076	0.054	1.17	0.089	/
		0	QPSK	50%	0	18900/1880	24.00	22.49	0.060	-0.037	1.42	0.085	/
	Right Tilt	0	QPSK	1	50	18900/1880	24.00	23.31	0.034	0.070	1.17	0.039	/
		0	QPSK	50%	0	18900/1880	24.00	22.49	0.026	0.020	1.42	0.036	/
LTE 41	Left cheek	0	QPSK	1	99	39750/2506	24.00	23.36	0.139	0.061	1.16	0.161	11
		0	QPSK	50%	50	39750/2506	23.00	22.50	0.116	0.025	1.12	0.130	/
	Left Tilt	0	QPSK	1	99	39750/2506	24.00	23.36	0.050	0.015	1.16	0.058	/
		0	QPSK	50%	50	39750/2506	23.00	22.50	0.039	0.023	1.12	0.044	/
	Right cheek	0	QPSK	1	99	39750/2506	24.00	23.36	0.108	0.046	1.16	0.125	/
		0	QPSK	50%	50	39750/2506	23.00	22.50	0.065	0.018	1.12	0.073	/
	Right Tilt	0	QPSK	1	99	39750/2506	24.00	23.36	0.086	0.026	1.16	0.100	/
		0	QPSK	50%	50	39750/2506	23.00	22.50	0.051	0.017	1.12	0.057	/



Band	Test Position	Dist. (mm)	Mode	Duty Cycle	Ch./Freq. (MHz)	Tune-up (dBm)	Measured power (dBm)	Measured SAR1g	Power Drift (dB)	Scaling Factor	Report SAR1g	Plot No.
Wi-Fi 2.4G	Left cheek	0	802.11b	100.0%	1/2412	19.00	18.12	0.934	-0.130	1.22	1.144	/
		0	802.11b	100.0%	6/2437	19.00	18.51	0.904	0.110	1.12	1.012	/
		0	802.11b	100.0%	11/2462	19.00	18.27	1.080	0.050	1.18	1.278	/
	Left Tilt	0	802.11b	100.0%	1/2412	19.00	18.12	1.090	0.037	1.22	1.335	/
		0	802.11b	100.0%	6/2437	19.00	18.51	1.060	0.180	1.12	1.187	/
		0	802.11b	100.0%	11/2462	19.00	18.27	1.240	0.022	1.18	1.467	12
	Left Tilt Repeated	0	802.11b	100.0%	11/2462	19.00	18.27	1.190	0.000	1.18	1.408	/
	Right cheek	0	802.11b	100.0%	6/2437	19.00	18.51	0.622	-0.130	1.12	0.696	/
	Right Tilt	0	802.11b	100.0%	1/2412	19.00	18.12	0.662	0.110	1.22	0.811	/
		0	802.11b	100.0%	6/2437	19.00	18.51	0.736	0.070	1.12	0.824	/
		0	802.11b	100.0%	11/2462	19.00	18.27	0.808	0.090	1.18	0.956	/
	U-NII-1	Left cheek	0	802.11n-HT20	100.0%	40/5200	15.50	14.54	1.110	-0.080	1.25	1.385
0			802.11n-HT20	100.0%	44/5220	15.50	14.62	0.977	0.100	1.22	1.196	/
0			802.11n-HT20	100.0%	48/5240	15.50	14.95	1.070	-0.050	1.14	1.214	/
Left Tilt		0	802.11n-HT20	100.0%	40/5200	15.50	14.54	1.170	0.040	1.25	1.459	/
		0	802.11n-HT20	100.0%	44/5220	15.50	14.62	1.200	0.020	1.22	1.470	13
		0	802.11n-HT20	100.0%	48/5240	15.50	14.95	0.928	-0.032	1.14	1.053	/
Left Tilt Repeated		0	802.11n-HT20	100.0%	40/5200	15.50	14.54	1.160	0.040	1.25	1.447	/
Right cheek		0	802.11n-HT20	100.0%	48/5240	15.50	14.95	0.507	-0.120	1.14	0.575	/
Right Tilt	0	802.11n-HT20	100.0%	48/5240	15.50	14.95	0.548	0.100	1.14	0.622	/	
U-NII-2A	Left cheek	0	802.11a	100.0%	56/5280	15.50	14.47	0.846	-0.028	1.27	1.072	/
		0	802.11a	100.0%	60/5300	15.50	14.60	0.789	0.070	1.23	0.971	/
		0	802.11a	100.0%	64/5320	15.50	14.72	1.030	0.038	1.20	1.233	/
	Left Tilt	0	802.11a	100.0%	56/5280	15.50	14.47	0.936	0.020	1.27	1.187	/
		0	802.11a	100.0%	60/5300	15.50	14.60	0.883	0.110	1.23	1.086	/
		0	802.11a	100.0%	64/5320	15.50	14.72	1.140	0.190	1.20	1.364	14
	Left Tilt Repeated	0	802.11a	100.0%	64/5320	15.50	14.72	1.090	0.000	1.20	1.304	/
	Right cheek	0	802.11a	100.0%	64/5320	15.50	14.72	0.551	0.040	1.20	0.659	/
	Right Tilt	0	802.11a	100.0%	64/5320	15.50	14.72	0.556	0.080	1.20	0.665	/
U-NII-2C	Left cheek	0	802.11a	100.0%	100/5500	15.50	14.81	0.481	0.084	1.17	0.564	/
	Left Tilt	0	802.11a	100.0%	100/5500	15.50	14.81	0.491	0.065	1.17	0.576	15
	Right cheek	0	802.11a	100.0%	100/5500	15.50	14.81	0.255	-0.037	1.17	0.299	/
	Right Tilt	0	802.11a	100.0%	100/5500	15.50	14.81	0.258	0.047	1.17	0.302	/
Bluetooth	Left cheek	0	DH5	77.0%	39/2441	10.50	9.81	0.065	0.030	1.52	0.098	/
	Left Tilt	0	DH5	77.0%	39/2441	10.50	9.81	0.074	0.059	1.52	0.113	16
	Right cheek	0	DH5	77.0%	39/2441	10.50	9.81	0.048	0.063	1.52	0.072	/
	Right Tilt	0	DH5	77.0%	39/2441	10.50	9.81	0.058	0.036	1.52	0.088	/

**Body-worn**

Band	Test Position	Dist. (mm)	Mode	RB	offset	Ch./Freq. (MHz)	Tune-up (dBm)	Measured power (dBm)	Measured SAR1g	Power Drift (dB)	Scaling Factor	Report SAR1g	Plot No.
GSM 1900	Back Side	15	GSM	-	-	661/1880	32.00	31.23	0.280	0.000	1.19	0.334	17
	Front Side	15	GSM	-	-	661/1880	32.00	31.23	0.204	-0.040	1.19	0.244	/
WCDMA II	Back Side	15	RMC	-	-	9400/1880	24.00	23.13	0.399	-0.090	1.22	0.487	18
	Front Side	15	RMC	-	-	9400/1880	24.00	23.13	0.288	-0.120	1.22	0.352	/
WCDMA IV	Back Side	15	RMC	-	-	1413/1732.6	24.00	23.18	0.329	-0.020	1.21	0.397	19
	Front Side	15	RMC	-	-	1413/1732.6	24.00	23.18	0.280	-0.027	1.21	0.338	/
LTE 2	Back Side	15	QPSK	1	50	18900/1880	24.00	23.31	0.337	0.100	1.17	0.395	20
		15	QPSK	50%	0	18900/1880	24.00	22.49	0.272	-0.010	1.42	0.385	/
	Front Side	15	QPSK	1	50	18900/1880	24.00	23.31	0.242	-0.180	1.17	0.284	/
		15	QPSK	50%	0	18900/1880	24.00	22.49	0.190	-0.120	1.42	0.269	/
LTE 41	Back Side	15	QPSK	1	99	39750/2506	24.00	23.36	0.278	-0.027	1.16	0.322	21
		15	QPSK	50%	50	39750/2506	23.00	22.50	0.214	0.011	1.12	0.240	/
	Front Side	15	QPSK	1	99	39750/2506	24.00	23.36	0.265	-0.069	1.16	0.307	/
		15	QPSK	50%	50	39750/2506	23.00	22.50	0.211	0.083	1.12	0.237	/

Band	Test Position	Dist. (mm)	Mode	Duty Cycle	Ch./Freq. (MHz)	Tune-up (dBm)	Measured power (dBm)	Measured SAR1g	Power Drift (dB)	Scaling Factor	Report SAR1g	Plot No.
Wi-Fi 2.4G	Back Side	15	802.11b	98.0%	6/2437	19.00	18.51	0.114	0.056	1.14	0.130	/
	Front Side	15	802.11b	98.0%	6/2437	19.00	18.51	0.119	0.030	1.14	0.136	22
U-NII-1	Back Side	15	802.11n-HT20	100.0%	48/5240	15.50	14.95	0.254	0.081	1.14	0.288	23
	Front Side	15	802.11n-HT20	100.0%	48/5240	15.50	14.95	0.091	0.031	1.14	0.103	/
U-NII-2A	Back Side	15	802.11a	100.0%	64/5320	15.50	14.72	0.159	0.100	1.20	0.190	24
	Front Side	15	802.11a	100.0%	64/5320	15.50	14.72	0.108	0.000	1.20	0.129	/
U-NII-2C	Back Side	15	802.11a	100.0%	100/5500	15.50	14.81	0.086	0.100	1.17	0.100	25
	Front Side	15	802.11a	100.0%	100/5500	15.50	14.81	0.065	-0.040	1.17	0.076	/



Hotspot

Band	Test Position	Dist. (mm)	Mode	RB	offset	Ch./Freq. (MHz)	Tune-up (dBm)	Measured power (dBm)	Measured SAR1g	Power Drift (dB)	Scaling Factor	Report SAR1g	Plot No.
GSM 1900	Back Side	10	2TX Slots	-	-	661/1880	31.00	30.11	0.547	0.038	1.23	0.671	/
	Front Side	10	2TX Slots	-	-	661/1880	31.00	30.11	0.394	-0.019	1.23	0.484	/
	Left Edge	10	2TX Slots	-	-	661/1880	31.00	30.11	0.138	0.024	1.23	0.169	/
	Right Edge	10	2TX Slots	-	-	661/1880	31.00	30.11	0.049	0.015	1.23	0.060	/
	Bottom Edge	10	2TX Slots	-	-	512/1850.2	31.00	30.18	0.703	-0.010	1.21	0.849	/
		10	2TX Slots	-	-	661/1880	31.00	30.11	0.718	0.074	1.23	0.881	26
		10	2TX Slots	-	-	810/1909.8	31.00	30.26	0.659	0.049	1.19	0.781	/
WCDMA II	Back Side	10	RMC	-	-	9262/1852.4	24.00	23.16	0.623	0.010	1.21	0.756	/
		10	RMC	-	-	9400/1880	24.00	23.13	0.676	-0.070	1.22	0.826	/
		10	RMC	-	-	9538/1907.6	24.00	23.17	0.721	0.020	1.21	0.873	/
	Front Side	10	RMC	-	-	9400/1880	24.00	23.13	0.438	0.100	1.22	0.535	/
	Left Edge	10	RMC	-	-	9400/1880	24.00	23.13	0.043	0.051	1.22	0.052	/
	Right Edge	10	RMC	-	-	9400/1880	24.00	23.13	0.227	0.120	1.22	0.277	/
	Bottom Edge	10	RMC	-	-	9400/1880	24.00	23.13	0.854	0.170	1.22	1.043	/
		10	RMC	-	-	9262/1852.4	24.00	23.16	0.978	0.180	1.21	1.187	/
		10	RMC	-	-	9538/1907.6	24.00	23.17	0.982	0.130	1.21	1.189	27
Bottom Edge Repeated	10	RMC	-	-	9538/1907.6	24.00	23.17	0.976	-0.021	1.21	1.182	/	
WCDMA IV	Back Side	10	RMC	-	-	1413/1732.6	24.00	23.18	0.572	-0.050	1.21	0.691	/
	Front Side	10	RMC	-	-	1413/1732.6	24.00	23.18	0.605	-0.130	1.21	0.731	/
	Left Edge	10	RMC	-	-	1413/1732.6	24.00	23.18	0.252	0.011	1.21	0.304	/
	Right Edge	10	RMC	-	-	1413/1732.6	24.00	23.18	0.208	0.039	1.21	0.251	/
	Bottom Edge	10	RMC	-	-	1413/1732.6	24.00	23.18	0.819	0.020	1.21	0.989	/
		10	RMC	-	-	1312/1712.4	24.00	23.17	0.825	0.021	1.21	0.999	/
		10	RMC	-	-	1513/1752.6	24.00	23.14	0.905	0.120	1.22	1.103	28
Bottom Edge Repeated	10	RMC	-	-	1513/1752.6	24.00	23.14	0.901	0.060	1.22	1.098	/	
LTE 2	Back Side	10	QPSK	1	50	18900/1880	24.00	23.31	0.642	0.050	1.17	0.753	/
		10	QPSK	50%	0	18900/1880	24.00	22.49	0.526	-0.070	1.42	0.745	/
	Front Side	10	QPSK	1	50	18900/1880	24.00	23.31	0.434	-0.050	1.17	0.509	/
		10	QPSK	50%	0	18900/1880	24.00	22.49	0.352	-0.020	1.42	0.498	/
	Left Edge	10	QPSK	1	50	18900/1880	24.00	23.31	0.131	0.011	1.17	0.154	/
		10	QPSK	50%	0	18900/1880	24.00	22.49	0.116	0.080	1.42	0.164	/
	Right Edge	10	QPSK	1	50	18900/1880	24.00	23.31	0.046	0.027	1.17	0.054	/
		10	QPSK	50%	0	18900/1880	24.00	22.49	0.000	0.039	1.42	0.000	/
	Bottom Edge	10	QPSK	1	50	18900/1880	24.00	23.31	0.898	0.024	1.17	1.053	/
		10	QPSK	50%	0	18900/1880	23.00	22.49	0.704	0.036	1.12	0.792	/
	Bottom Edge	10	QPSK	100%	0	18700/1860	23.00	22.26	0.725	0.039	1.19	0.860	/
		10	QPSK	100%	0	19100/1900	23.00	22.29	0.793	-0.120	1.18	0.934	/
10		QPSK	100%	0	18900/1880	23.00	22.45	0.758	0.080	1.14	0.860	/	



	Bottom Edge	10	QPSK	1	50	18700/1860	24.00	23.17	0.912	0.070	1.21	1.104	/
		10	QPSK	1	0	19100/1900	24.00	23.31	0.947	0.070	1.17	1.110	29
	Bottom Edge Repeated	10	QPSK	1	0	19100/1900	24.00	23.31	0.935	0.036	1.17	1.096	/
LTE 41	Back Side	10	QPSK	1	99	39750/2506	24.00	23.36	0.444	0.190	1.16	0.514	30
		10	QPSK	50%	50	39750/2506	23.00	22.50	0.313	0.015	1.12	0.351	/
	Front Side	10	QPSK	1	99	39750/2506	24.00	23.36	0.357	0.060	1.16	0.414	/
		10	QPSK	50%	50	39750/2506	23.00	22.50	0.281	-0.038	1.12	0.315	/
	Left Edge	10	QPSK	1	99	39750/2506	24.00	23.36	0.115	0.000	1.16	0.133	/
		10	QPSK	50%	50	39750/2506	23.00	22.50	0.105	0.012	1.12	0.118	/
	Right Edge	10	QPSK	1	99	39750/2506	24.00	23.36	0.031	0.142	1.16	0.036	/
		10	QPSK	50%	50	39750/2506	23.00	22.50	0.032	0.039	1.12	0.036	/
	Bottom Edge	10	QPSK	1	99	39750/2506	24.00	23.36	0.376	-0.024	1.16	0.436	/
		10	QPSK	50%	50	39750/2506	23.00	22.50	0.263	0.021	1.12	0.295	/

Band	Test Position	Dist. (mm)	Mode	Duty Cycle	Ch./Freq. (MHz)	Tune-up (dBm)	Measured power (dBm)	Measured SAR1g	Power Drift (dB)	Scaling Factor	Report SAR1g	Plot No.
Wi-Fi 2.4G	Back Side	10	802.11b	98.0%	6/2437	19.00	18.51	0.304	-0.036	1.14	0.347	/
	Front Side	10	802.11b	98.0%	6/2437	19.00	18.51	0.271	0.027	1.14	0.310	/
	Left Edge	10	802.11b	98.0%	6/2437	19.00	18.51	0.037	0.023	1.14	0.043	/
	Right Edge	10	802.11b	98.0%	6/2437	19.00	18.51	0.066	0.145	1.14	0.075	/
	Top Edge	10	802.11b	98.0%	6/2437	19.00	18.51	0.321	0.044	1.14	0.367	31
U-NII-1	Back Side	10	802.11n-HT20	100.0%	48/5240	15.50	14.95	0.355	0.052	1.14	0.403	/
	Front Side	10	802.11n-HT20	100.0%	48/5240	15.50	14.95	0.153	-0.013	1.14	0.174	/
	Left Edge	10	802.11n-HT20	100.0%	48/5240	15.50	14.95	0.093	0.000	1.14	0.106	/
	Right Edge	10	802.11n-HT20	100.0%	48/5240	15.50	14.95	0.114	0.062	1.14	0.129	/
	Top Edge	10	802.11n-HT20	100.0%	48/5240	15.50	14.95	0.368	0.090	1.14	0.418	32
U-NII-2A	Back Side	10	802.11a	100.0%	64/5320	15.50	14.72	0.342	0.100	1.20	0.409	33
	Front Side	10	802.11a	100.0%	64/5320	15.50	14.72	0.167	0.038	1.20	0.200	/
	Left Edge	10	802.11a	100.0%	64/5320	15.50	14.72	0.087	0.018	1.20	0.104	/
	Right Edge	10	802.11a	100.0%	64/5320	15.50	14.72	0.113	-0.020	1.20	0.135	/
	Top Edge	10	802.11a	100.0%	64/5320	15.50	14.72	0.297	0.043	1.20	0.355	/
U-NII-2C	Back Side	10	802.11a	100.0%	100/5500	15.50	14.81	0.164	0.100	1.17	0.192	34
	Front Side	10	802.11a	100.0%	100/5500	15.50	14.81	0.105	0.095	1.17	0.123	/
	Left Edge	10	802.11a	100.0%	100/5500	15.50	14.81	0.062	0.027	1.17	0.073	/
	Right Edge	10	802.11a	100.0%	100/5500	15.50	14.81	0.098	-0.013	1.17	0.115	/
	Top Edge	10	802.11a	100.0%	100/5500	15.50	14.81	0.107	-0.010	1.17	0.125	/
Bluetooth	Back Side	10	DH5	77.0%	39/2441	10.50	9.81	0.015	0.036	1.52	0.023	/
	Front Side	10	DH5	77.0%	39/2441	10.50	9.81	0.012	0.187	1.52	0.019	/
	Left Edge	10	DH5	77.0%	39/2441	10.50	9.81	0.000	0.000	1.52	0.000	/
	Right Edge	10	DH5	77.0%	39/2441	10.50	9.81	0.005	0.100	1.52	0.008	/
	Top Edge	10	DH5	77.0%	39/2441	10.50	9.81	0.029	0.116	1.52	0.045	35

10.3 Simultaneous Transmission Analysis

Simultaneous Transmission Configurations	Head	Body-worn	Hotspot
WWAN + WLAN 2.4GHz	Yes	Yes	Yes
WWAN + WLAN 5GHz	Yes	Yes	Yes
WWAN+ Bluetooth	Yes	Yes	Yes

General Note:

1. The Scaled SAR summation is calculated based on the same configuration and test position.

2. Per KDB 447498 D01, simultaneous transmission SAR is compliant if,

i) Scalar SAR summation $< 1.6\text{W/kg}$, simultaneously transmission SAR measurement is not necessary.

ii) $\text{SPLSR} = (\text{SAR1} + \text{SAR2})^{1.5} / (\text{min. separation distance, mm})$, and the peak separation distance is determined from the square root of $[(x1-x2)^2 + (y1-y2)^2 + (z1-z2)^2]$, where $(x1, y1, z1)$ and $(x2, y2, z2)$ are the coordinates of the extrapolated peak SAR locations in the zoom scan.

iii) If $\text{SPLSR} \leq 0.04$, simultaneously transmission SAR measurement is not necessary.

**The maximum SAR_{1g} Value for Main-Antenna**

SAR _{1g} (W/kg)		GSM 1900	WCDMA Band II	WCDMA Band IV	LTE FDD 2	LTE TDD 41	MAX. SAR _{1g}
Test Position							
Head	Left Cheek	0.110	0.186	0.112	0.118	0.161	0.186
	Left Tilt	0.058	0.079	0.107	0.047	0.058	0.107
	Right Cheek	0.084	0.131	0.164	0.089	0.125	0.164
	Right Tilt	0.060	0.078	0.065	0.039	0.100	0.100
Body worn	Back Side	0.334	0.487	0.397	0.395	0.322	0.487
	Front Side	0.244	0.352	0.338	0.284	0.307	0.352
Hotspot	Back Side	0.671	0.873	0.691	0.753	0.514	0.873
	Front Side	0.484	0.535	0.731	0.509	0.414	0.731
	Left Edge	0.169	0.052	0.304	0.164	0.133	0.304
	Right Edge	0.060	0.277	0.251	0.054	0.036	0.277
	Top Edge	NA	NA	NA	NA	NA	NA
	Bottom Edge	0.881	1.189	1.103	1.110	0.436	1.189

About Bluetooth and Main- Antenna

SAR _{1g} (W/kg)		Main-antenna	Bluetooth	MAX. ΣSAR _{1g}
Test Position				
Head	Left, Cheek	0.186	0.098	0.284
	Left, Tilt	0.107	0.113	0.220
	Right, Cheek	0.164	0.072	0.236
	Right, Tilt	0.100	0.088	0.188
Body worn	Back Side	0.487	0.023	0.510
	Front Side	0.352	0.019	0.371
Hotspot	Back Side	0.873	0.023	0.896
	Front Side	0.731	0.019	0.750
	Left Edge	0.304	0.000	0.304
	Right Edge	0.277	0.008	0.285
	Top Edge	NA	0.045	0.045
	Bottom Edge	1.189	NA	1.189

Note: 1.The value with blue color is the maximum ΣSAR_{1g}Value.
 2.MAX. ΣSAR_{1g}=Unlicensed SAR_{MAX} +Licensed SAR_{MAX}

MAX. ΣSAR_{1g} = 1.189W/kg < 1.6W/kg, so the Simultaneous transimition SAR with volum scan are not required for Bluetooth and Main-Antenna.

About Wi-Fi 2.4G and Main-Antenna

SAR _{1g} (W/kg)		Main- antenna	Wi-Fi 2.4G	MAX. ΣSAR _{1g}
Test Position				
Head	Left, Cheek	0.186	1.278	1.464
	Left, Tilt	0.107	1.467	1.574
	Right, Cheek	0.164	0.696	0.860
	Right, Tilt	0.100	0.956	1.056
Body worn	Back Side	0.487	0.130	0.617
	Front Side	0.352	0.136	0.488
Hotspot	Back Side	0.873	0.347	1.220
	Front Side	0.731	0.310	1.041
	Left Edge	0.304	0.043	0.347
	Right Edge	0.277	0.075	0.352
	Top Edge	NA	0.367	0.367
	Bottom Edge	1.189	NA	1.189

Note: 1.The value with blue color is the maximum ΣSAR_{1g} Value.
 2.MAX. ΣSAR_{1g} =Unlicensed SAR_{MAX} +Licensed SAR_{MAX}

MAX. ΣSAR_{1g} = 1.574W/kg<1.6W/kg, so the Simultaneous transimition SAR with volum scan are not required for Wi-Fi 2.4G and Main-Antenna.

About Wi-Fi 5G and Main-Antenna

SAR _{1g} (W/kg)		Main-antenna	Wi-Fi (U-NII-1)	Wi-Fi (U-NII-2A)	Wi-Fi (U-NII-2C)	MAX. ΣSAR _{1g}
Test Position						
Head	Left, Cheek	0.186	1.385	1.233	0.564	1.571
	Left, Tilt	0.107	1.470	1.364	0.576	1.577
	Right, Cheek	0.164	0.575	0.659	0.299	0.823
	Right, Tilt	0.100	0.622	0.665	0.302	0.765
Body worn	Back Side	0.487	0.288	0.190	0.100	0.775
	Front Side	0.352	0.103	0.129	0.076	0.481
Hotspot	Back Side	0.873	0.403	0.409	0.192	1.282
	Front Side	0.731	0.174	0.200	0.123	0.931
	Left Edge	0.304	0.106	0.104	0.073	0.410
	Right Edge	0.277	0.129	0.135	0.115	0.412
	Top Edge	NA	0.418	0.355	0.125	0.418
	Bottom Edge	1.189	NA	NA	NA	1.189

Note: 1.The value with blue color is the maximum ΣSAR_{1g} Value.
 2.MAX. ΣSAR_{1g} =Unlicensed SAR_{MAX} +Licensed SAR_{MAX}

MAX. ΣSAR_{1g} = 1.577 W/kg < 1.6W/kg, so the Simultaneous transimition SAR with volum scan are not required for Wi-Fi 5G and Main-Antenna.



11 Measurement Uncertainty

Per KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz, when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg, the extensive SAR measurement uncertainty analysis described in IEEE Std 1528- 2013 is not required in SAR reports submitted for equipment approval.

ANNEX A: Test Layout

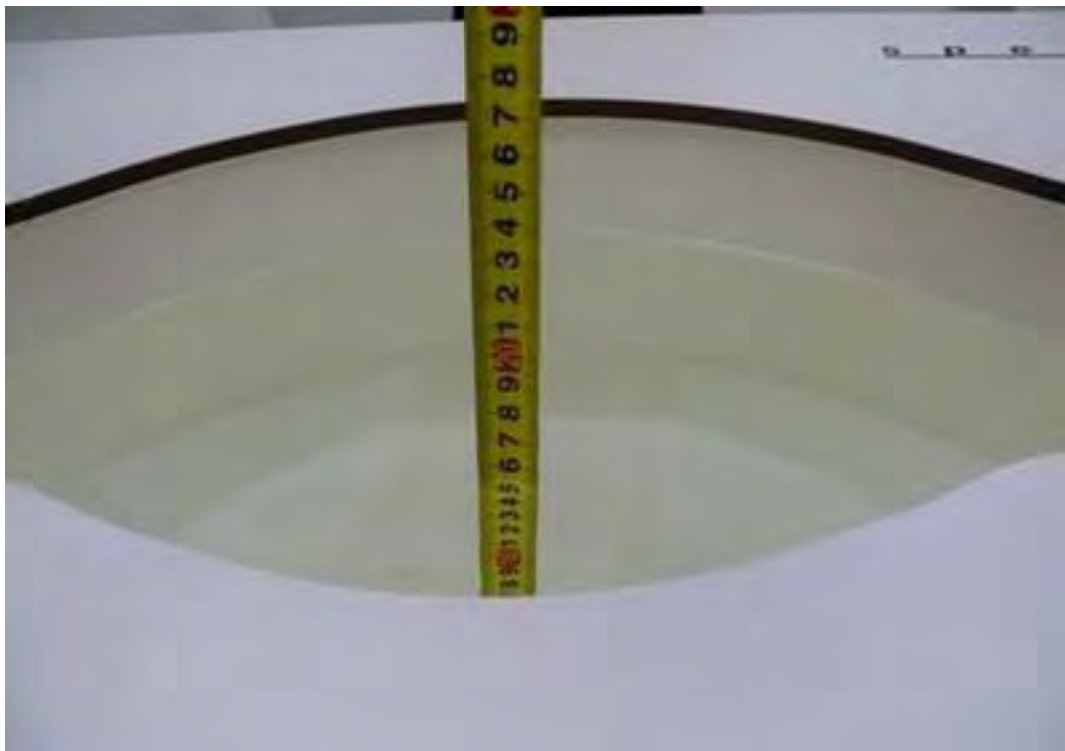


Tissue Simulating Liquids

For the measurement of the field distribution inside the flat phantom with DASY, the phantom must be filled with around 25 liters of homogeneous body tissue simulating liquid. For Head and 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 Picture 3 and Picture 4.



Picture 3: liquid depth in the head Phantom



Picture 4: Liquid depth in the flat Phantom

ANNEX B: System Check Results

Plot 1 System Performance Check at 1750 MHz TSL

DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2

Date: 8/19/2021

Communication System: CW; Frequency: 1750 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 1750$ MHz; $\sigma = 1.34$ S/m; $\epsilon_r = 40.1$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN7628; ConvF(8.76, 8.76, 8.76); Calibrated: 2/16/2021;

Electronics: DAE4 SN1317; Calibrated: 2/23/2021

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

d=10mm, Pin=250mW/Area Scan (5x8x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 9.77 mW/g

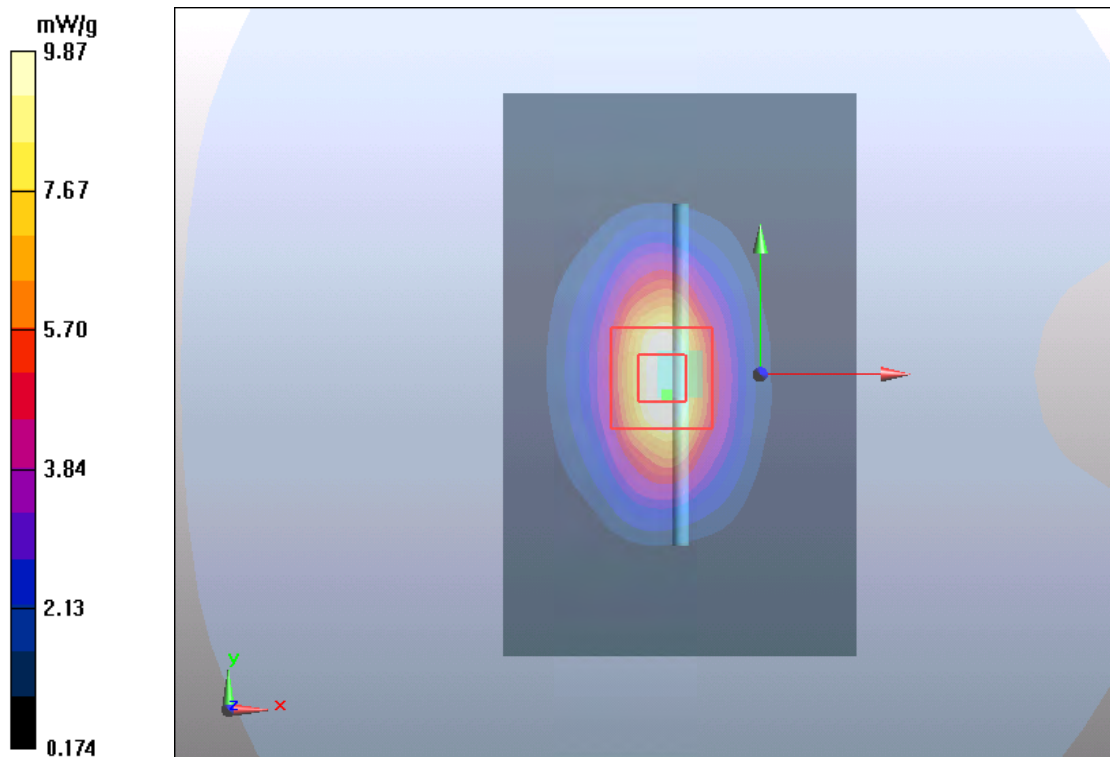
d=10mm, Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 80 V/m; Power Drift = 0.055 dB

Peak SAR (extrapolated) = 15.51 W/kg

SAR(1 g) = 9.11 mW/g; SAR(10 g) = 4.77 mW/g

Maximum value of SAR (measured) = 9.87 mW/g



Plot 2 System Performance Check at 1900 MHz

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

Date: 8/20/2021

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 1900 \text{ MHz}$; $\sigma = 1.40 \text{ mho/m}$; $\epsilon_r = 40.0$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature: $22.3 \text{ }^\circ\text{C}$ Liquid Temperature: $21.5 \text{ }^\circ\text{C}$

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN7628; ConvF(8.38, 8.38, 8.38); Calibrated: 2/16/2021;

Electronics: DAE4 SN1317; Calibrated: 2/23/2021

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

d=10mm, Pin=250mW/Area Scan (4x7x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 12.9 mW/g

d=10mm, Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm,

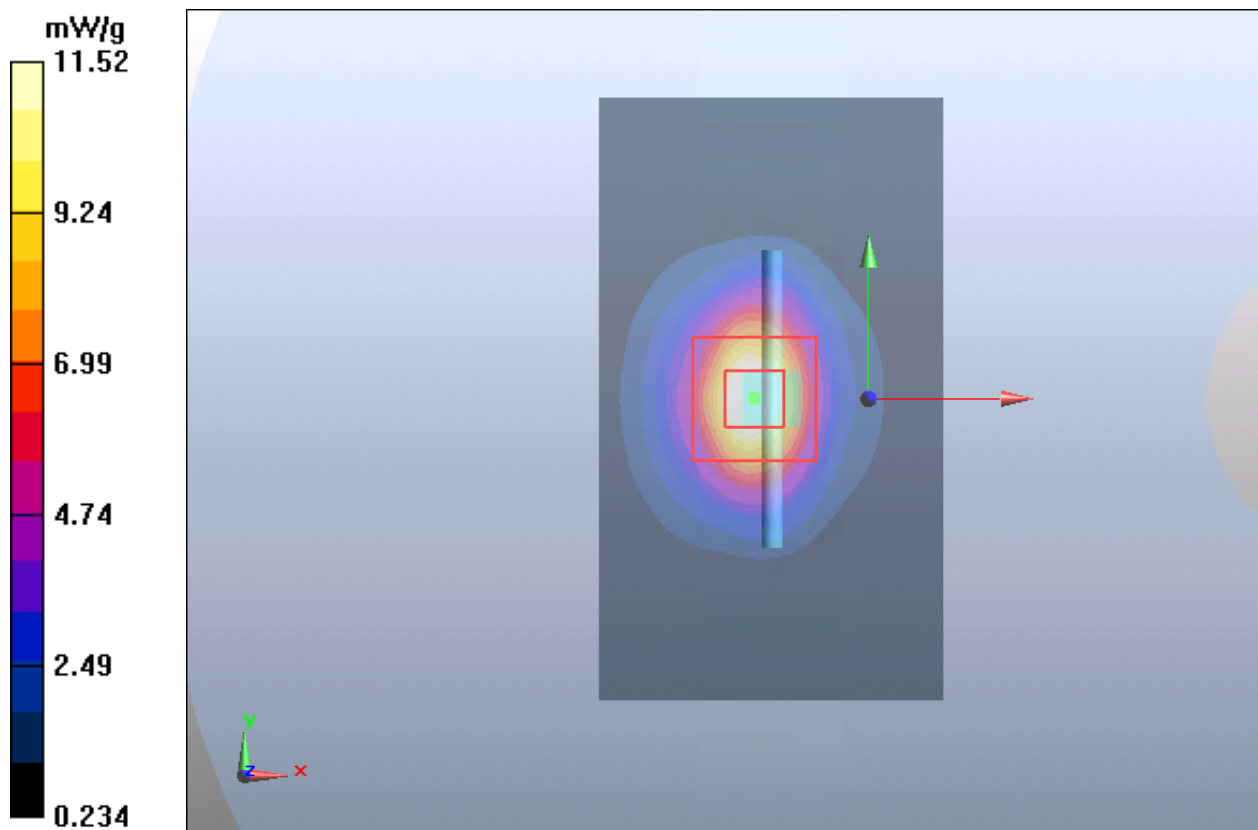
dz=5mm

Reference Value = 87.8 V/m; Power Drift = 0.030 dB

Peak SAR (extrapolated) = 20.1 W/kg

SAR(1 g) = 10.55 mW/g; SAR(10 g) = 5.39 mW/g

Maximum value of SAR (measured) = 11.52 mW/g



Plot 3 System Performance Check at 2450 MHz TSL

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2

Date: 8/21/2021

Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 2450 \text{ MHz}$; $\sigma = 1.81 \text{ S/m}$; $\epsilon_r = 38.6$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature: $22.3 \text{ }^\circ\text{C}$ Liquid Temperature: $21.5 \text{ }^\circ\text{C}$

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN7628; ConvF(8.01, 8.01, 8.01); Calibrated: 2/16/2021;

Electronics: DAE4 SN1317; Calibrated: 2/23/2021

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

d=10mm, Pin=250mW/Area Scan (4x7x1): Measurement grid: dx=12mm, dy=12mm

Maximum value of SAR (measured) = 18.2 mW/g

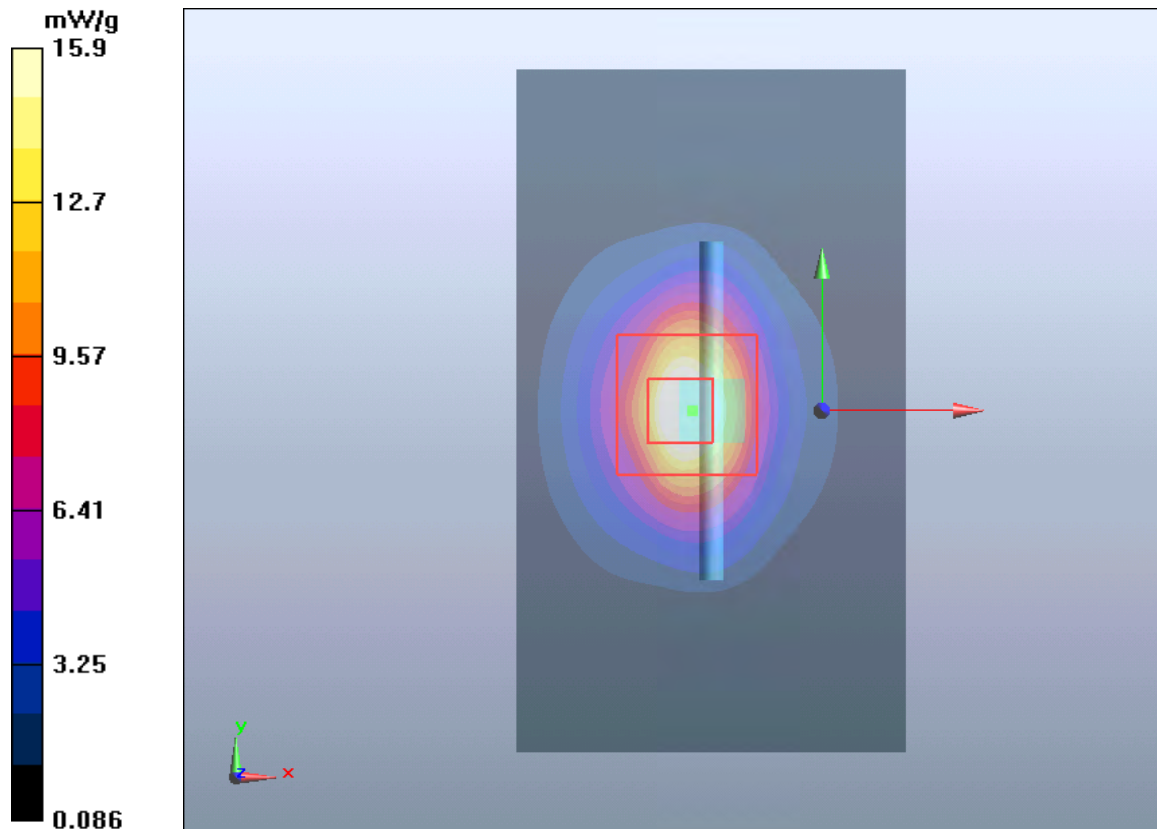
d=10mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 88.8 V/m; Power Drift = 0.075 dB

Peak SAR (extrapolated) = 30 W/kg

SAR(1 g) = 13.7 mW/g; SAR(10 g) = 6.22 mW/g

Maximum value of SAR (measured) = 15.9 mW/g



Plot 4 System Performance Check at 2600 MHz TSL

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2

Date: 8/19/2021

Communication System: CW; Frequency: 2600 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 2600$ MHz; $\sigma = 1.96$ mho/m; $\epsilon_r = 38.2$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN7628; ConvF(7.71, 7.71, 7.71); Calibrated: 2/16/2021;

Electronics: DAE4 SN1317; Calibrated: 2/23/2021

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

d=10mm, Pin=250mW/Area Scan (6x10x1): Measurement grid: dx=12mm, dy=12mm

Maximum value of SAR (measured) = 17.439 mW/g

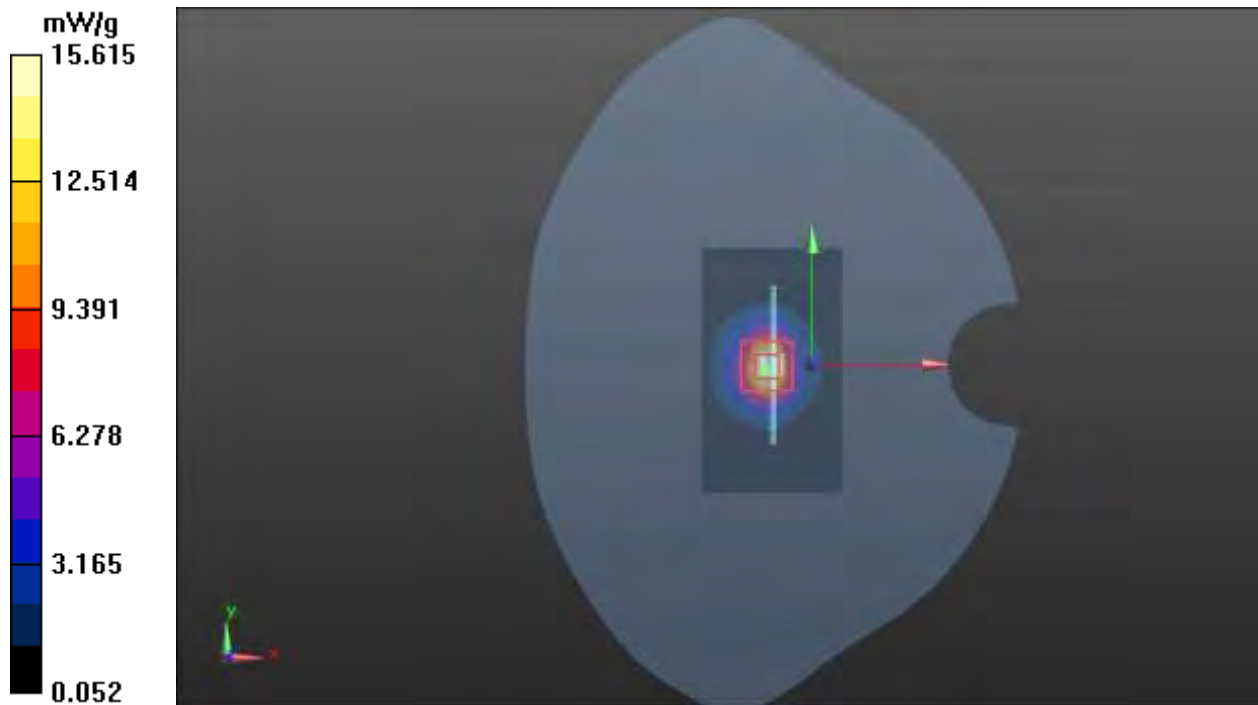
d=10mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 87.998 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 31.858 W/kg

SAR(1 g) = 13.9 mW/g; SAR(10 g) = 6.08 mW/g

Maximum value of SAR (measured) = 15.615 mW/g



Plot 5 System Performance Check at 5250 MHz TSL**DUT: Dipole 5250 MHz; Type: D5GHzV2; Serial: D5GHzV2**

Date: 9/4/2021

Communication System: CW; Frequency: 5250 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 5250$ MHz; $\sigma = 4.80$ S/m; $\epsilon_r = 35.5$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN7628; ConvF(5.51, 5.51, 5.51); Calibrated: 2/16/2021;

Electronics: DAE4 SN1317; Calibrated: 2/23/2021

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

d=10mm, Pin=100mW/Area Scan (6x10x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 9.14 mW/g

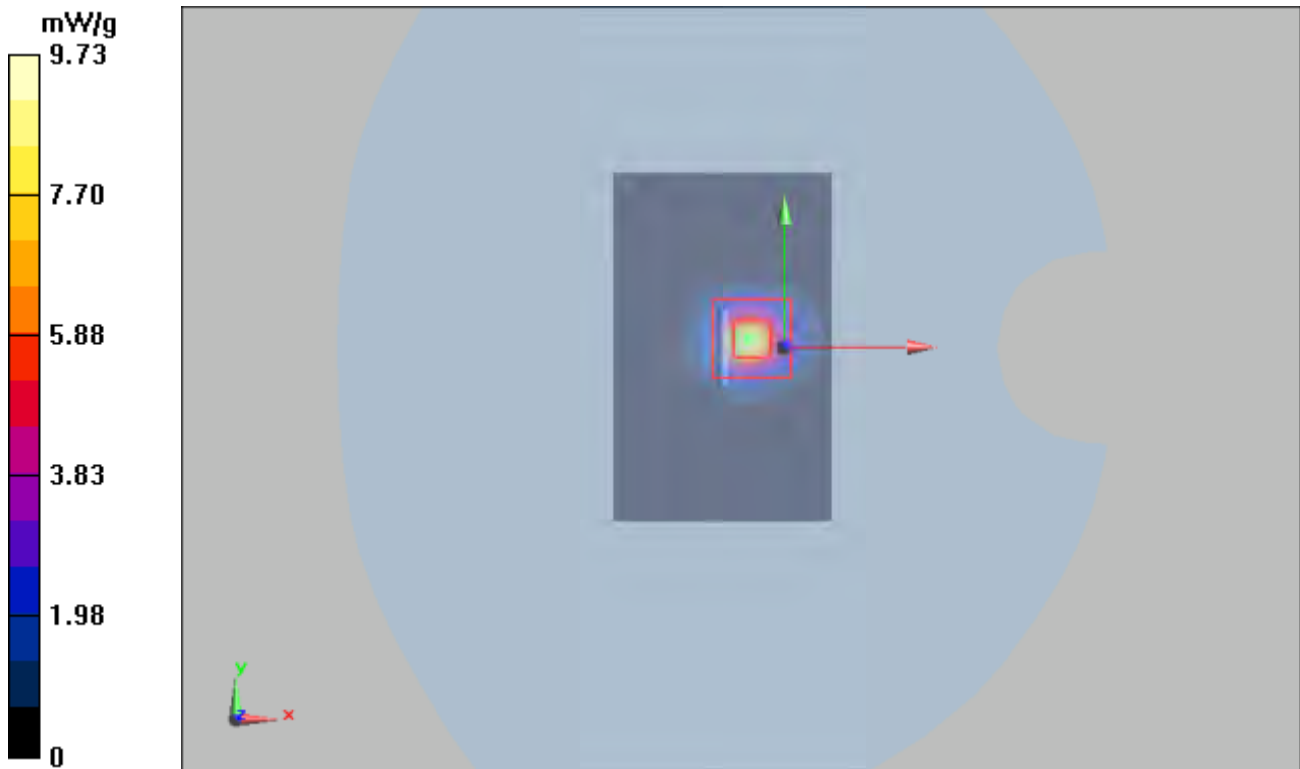
d=10mm, Pin=100mW/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 33.6 V/m; Power Drift = -0.095 dB

Peak SAR (extrapolated) = 52.2 W/kg

SAR(1 g) = 7.87 mW/g; SAR(10 g) = 2.25 mW/g

Maximum value of SAR (measured) = 9.73 mW/g



Plot 6 System Performance Check at 5600 MHz TSL

DUT: Dipole 5600 MHz; Type: D5GHzV2; Serial: D5GHzV2

Date: 9/4/2021

Communication System: CW; Frequency: 5600 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 5600$ MHz; $\sigma = 5.21$ S/m; $\epsilon_r = 34.2$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN7628; ConvF(5.00, 5.00, 5.00); Calibrated: 2/16/2021;

Electronics: DAE4 SN1317; Calibrated: 2/23/2021

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

d=10mm, Pin=100mW/Area Scan (6x10x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 8.25 mW/g

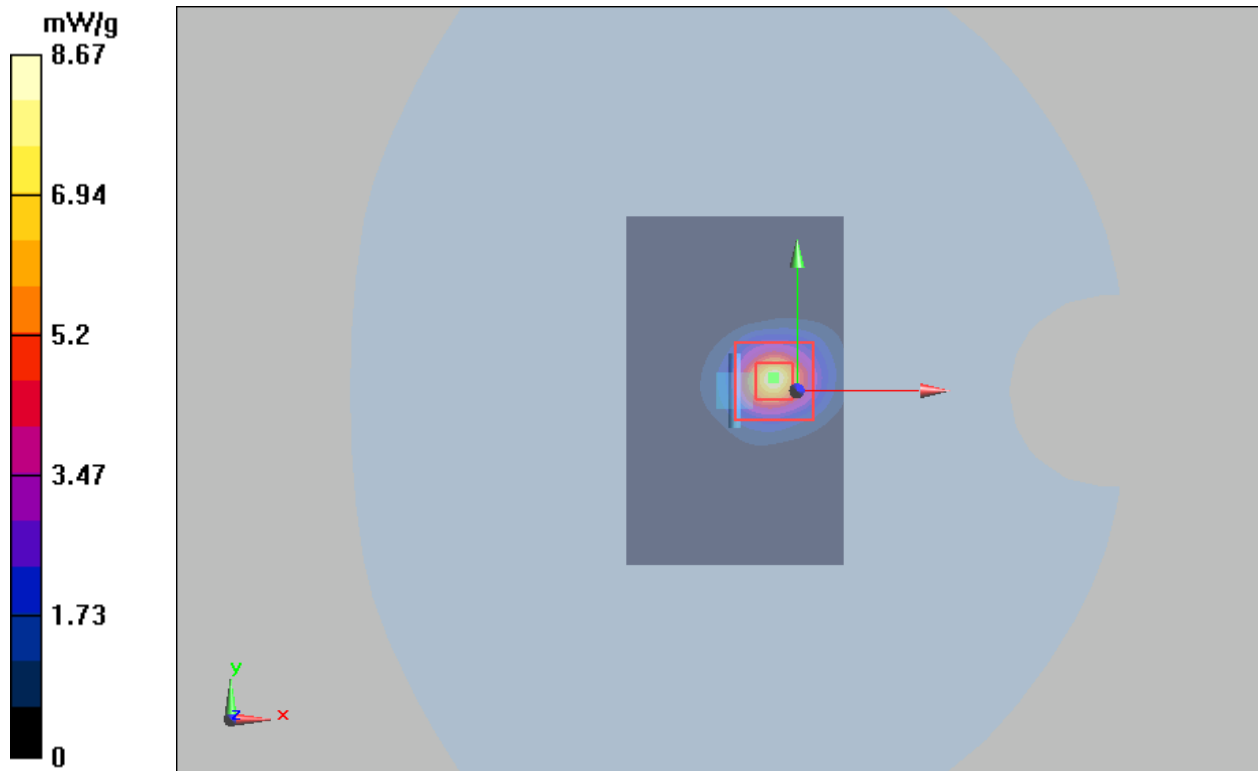
d=10mm, Pin=100mW/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 23.1 V/m; Power Drift = -0.028 dB

Peak SAR (extrapolated) = 22.9 W/kg

SAR(1 g) = 7.67 mW/g; SAR(10 g) = 2.27 mW/g

Maximum value of SAR (measured) = 8.67 mW/g



ANNEX C: Highest Graph Results

Plot 7 GSM 1900 Left Cheek Middle

Date: 8/20/2021

Communication System: UID 0, GSM (0); Frequency: 1880 MHz; Duty Cycle: 1:8.30042

Medium parameters used: $f = 1880$ MHz; $\sigma = 1.42$ S/m; $\epsilon_r = 38.948$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

Phantom section: Left Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN7628; ConvF(8.38, 8.38, 8.38); Calibrated: 2/16/2021;

Electronics: DAE4 SN1317; Calibrated: 2/23/2021

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Left Cheek Middle/Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.0981 W/kg

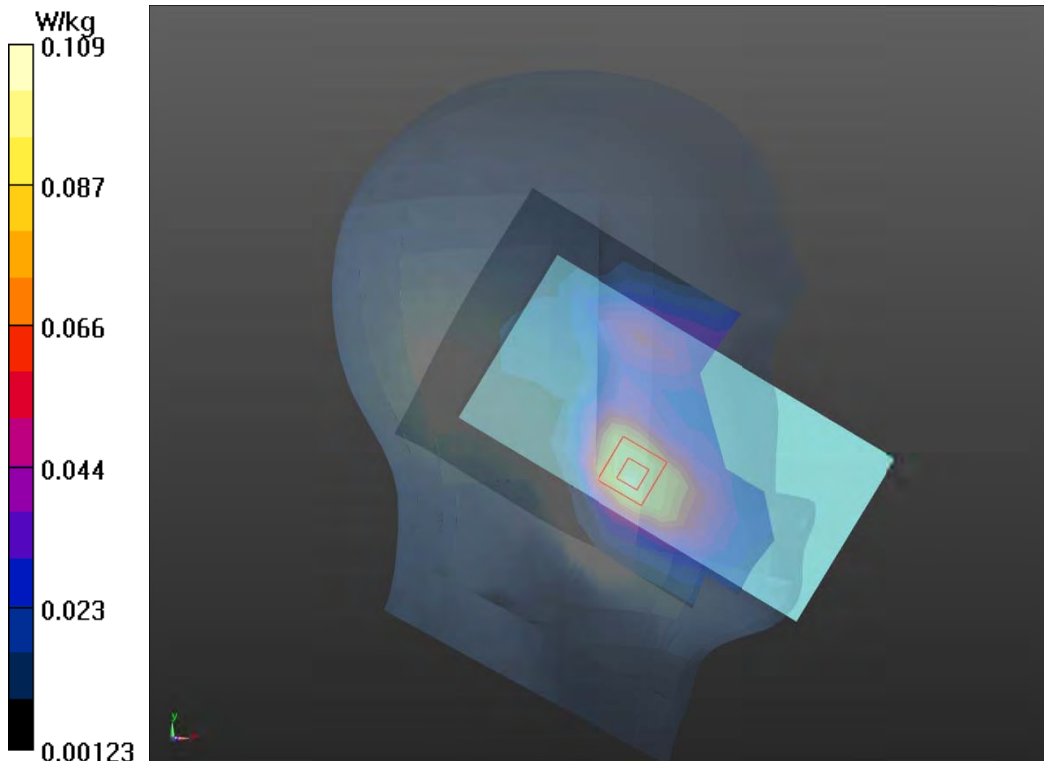
Left Cheek Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 2.981 V/m; Power Drift = -0.022 dB

Peak SAR (extrapolated) = 0.150 W/kg

SAR(1 g) = 0.092 W/kg; SAR(10 g) = 0.055 W/kg

Maximum value of SAR (measured) = 0.109 W/kg



Plot 8 UMTS Band II Left Cheek Middle

Date: 8/20/2021

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

Medium parameters used: $f = 1880$ MHz; $\sigma = 1.42$ S/m; $\epsilon_r = 38.948$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5°C

Phantom section: Left Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN7628; ConvF(8.38, 8.38, 8.38); Calibrated: 2/16/2021;

Electronics: DAE4 SN1317; Calibrated: 2/23/2021

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Left Cheek Middle/Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.169 W/kg

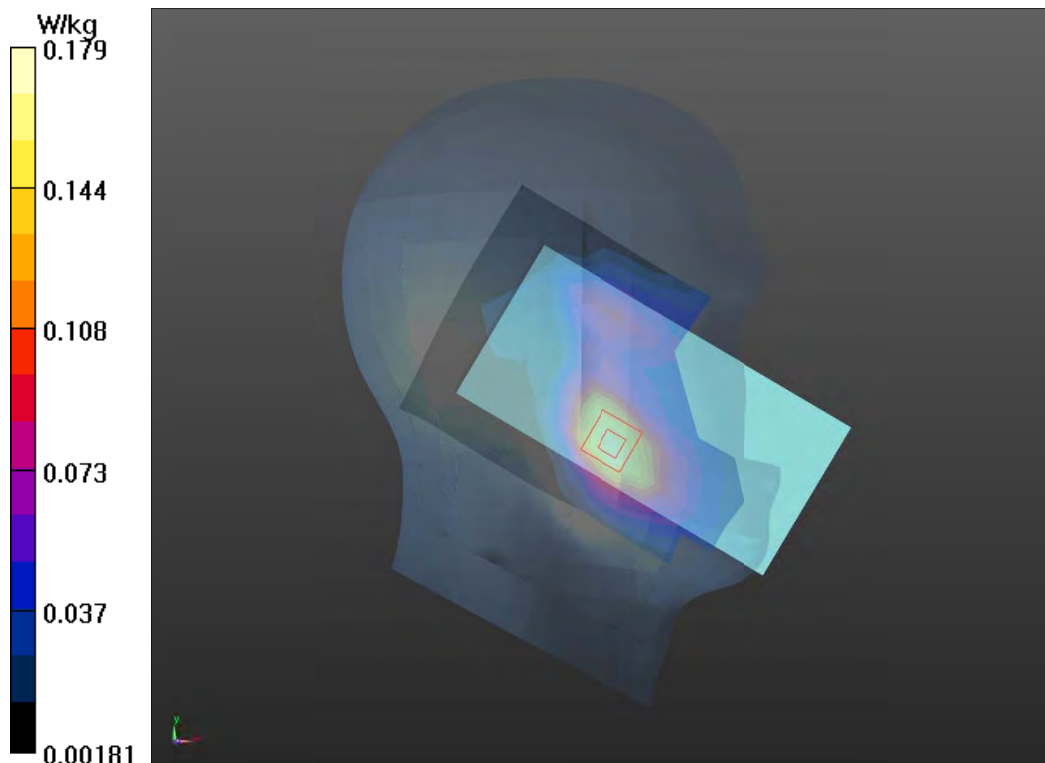
Left Cheek Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 4.029 V/m; Power Drift = 0.020 dB

Peak SAR (extrapolated) = 0.243 W/kg

SAR(1 g) = 0.152 W/kg; SAR(10 g) = 0.094 W/kg

Maximum value of SAR (measured) = 0.179 W/kg



Plot 9 UMTS Band IV Right Cheek Middle

Date: 8/19/2021

Communication System: UID 0, WCDMA (0); Frequency: 1732.6 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 1733 \text{ MHz}$; $\sigma = 1.312 \text{ S/m}$; $\epsilon_r = 39.365$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature: $22.3 \text{ }^\circ\text{C}$ Liquid Temperature: $21.5 \text{ }^\circ\text{C}$

Phantom section: Right Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN7628; ConvF(8.76, 8.76, 8.76); Calibrated: 2/16/2021;

Electronics: DAE4 SN1317; Calibrated: 2/23/2021

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Right Cheek Middle/Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (measured) = 0.156 W/kg

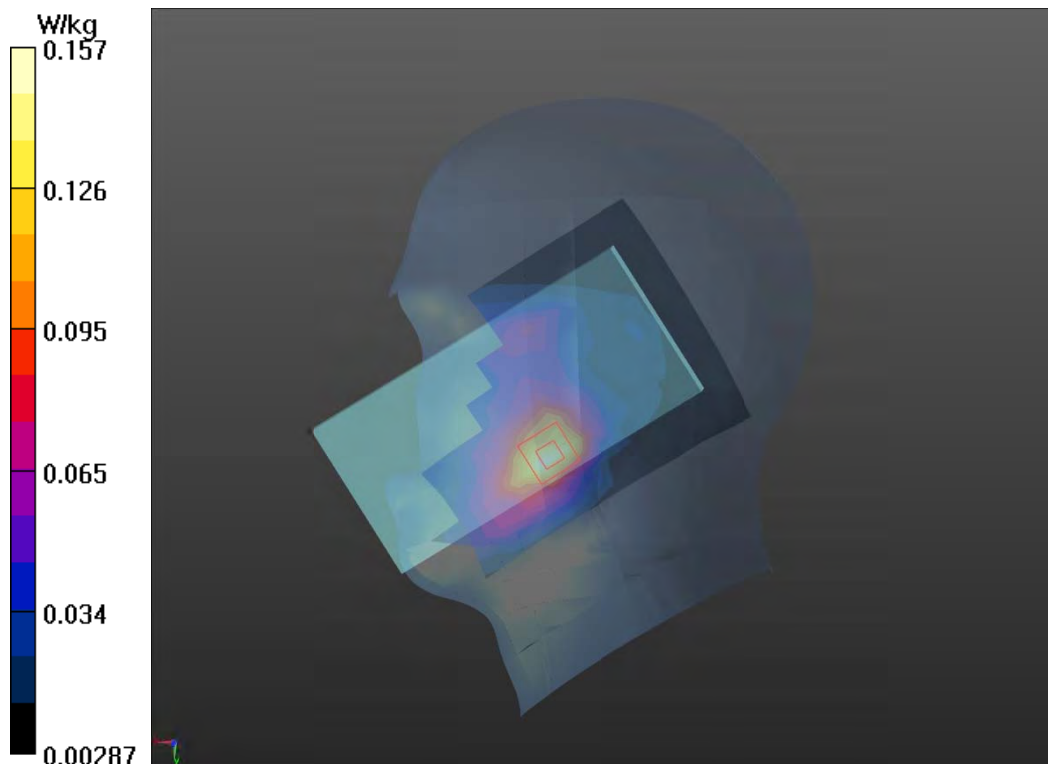
Right Cheek Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 3.763 V/m ; Power Drift = 0.048 dB

Peak SAR (extrapolated) = 0.198 W/kg

SAR(1 g) = 0.136 W/kg ; SAR(10 g) = 0.085 W/kg

Maximum value of SAR (measured) = 0.157 W/kg



Plot 10 LTE Band 2 1RB Left Cheek Middle

Date: 8/20/2021

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

Medium parameters used: $f = 1880$ MHz; $\sigma = 1.42$ S/m; $\epsilon_r = 38.948$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5°C

Phantom section: Left Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN7628; ConvF(8.38, 8.38, 8.38); Calibrated: 2/16/2021;

Electronics: DAE4 SN1317; Calibrated: 2/23/2021

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Left Cheek Middle/Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.111 W/kg

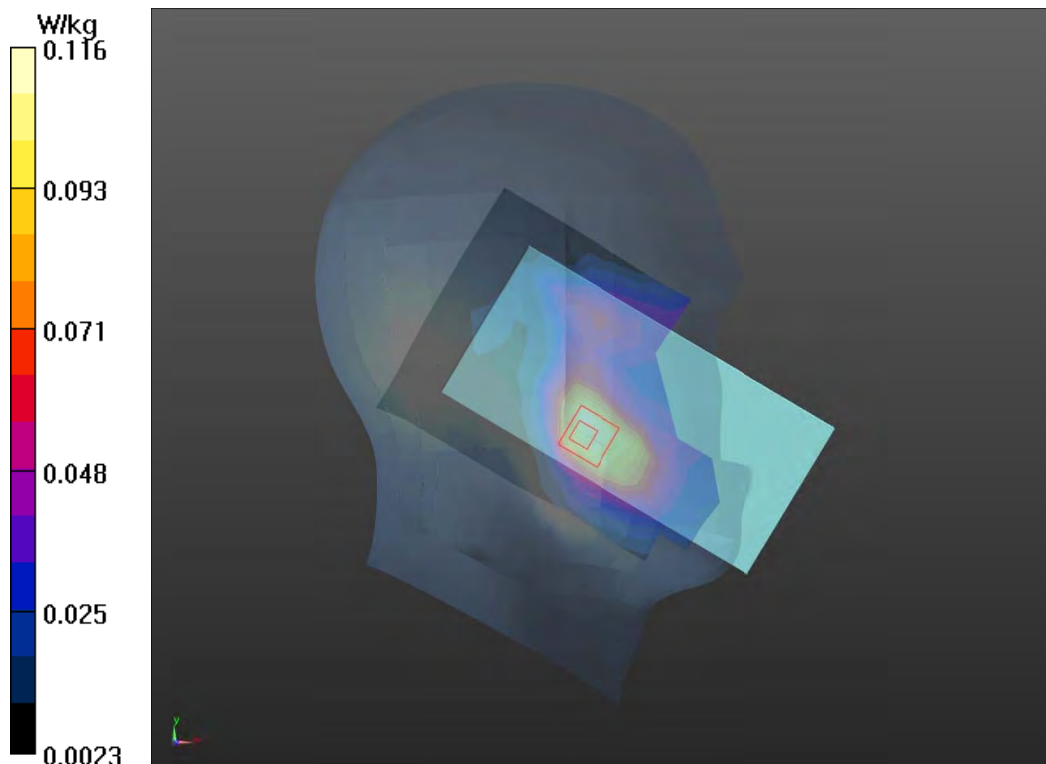
Left Cheek Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 3.166 V/m; Power Drift = -0.08 dB

Peak SAR (extrapolated) = 0.156 W/kg

SAR(1 g) = 0.101 W/kg; SAR(10 g) = 0.063 W/kg

Maximum value of SAR (measured) = 0.116 W/kg



Plot 11 LTE Band 41 1RB Left Cheek Low

Date: 8/19/2021

Communication System: UID 0, LTE (0); Frequency: 2506 MHz; Duty Cycle: 1:1.58

Medium parameters used: $f = 2506$ MHz; $\sigma = 1.905$ S/m; $\epsilon_r = 37.414$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

Phantom section: Left Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN7628; ConvF(7.71, 7.71, 7.71); Calibrated: 2/16/2021;

Electronics: DAE4 SN1317; Calibrated: 2/23/2021

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Left Cheek Low/Area Scan (10x18x1): Measurement grid: dx=12mm, dy=12mm

Maximum value of SAR (measured) = 0.120 W/kg

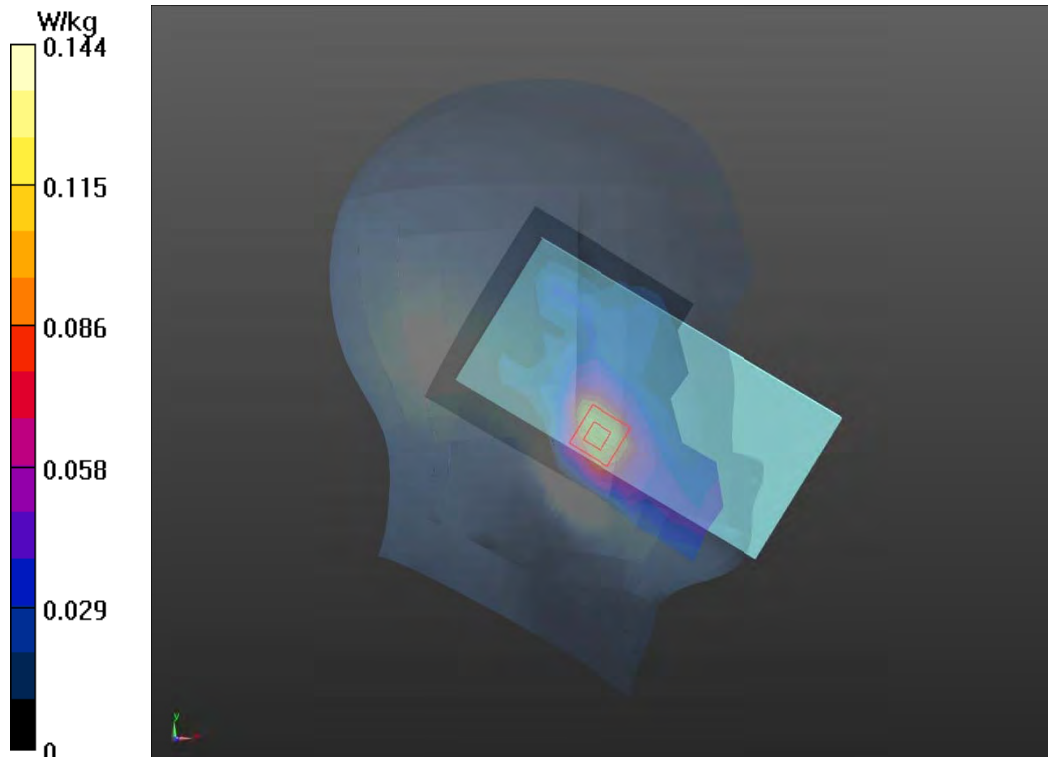
Left Cheek Low/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 1.012 V/m; Power Drift = 0.061 dB

Peak SAR (extrapolated) = 0.243 W/kg

SAR(1 g) = 0.139 W/kg; SAR(10 g) = 0.072 W/kg

Maximum value of SAR (measured) = 0.144 W/kg



Plot 12 802.11b Left Tilt High

Date: 8/21/2021

Communication System: UID 0, 802.11b (0); Frequency: 2462 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 2462$ MHz; $\sigma = 1.859$ S/m; $\epsilon_r = 37.58$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

Phantom section: Left Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN7628; ConvF(8.01, 8.01, 8.01); Calibrated: 2/16/2021;

Electronics: DAE4 SN1317; Calibrated: 2/23/2021

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Left Tilt High/Area Scan (10x18x1): Measurement grid: dx=12mm, dy=12mm

Maximum value of SAR (measured) = 1.37 W/kg

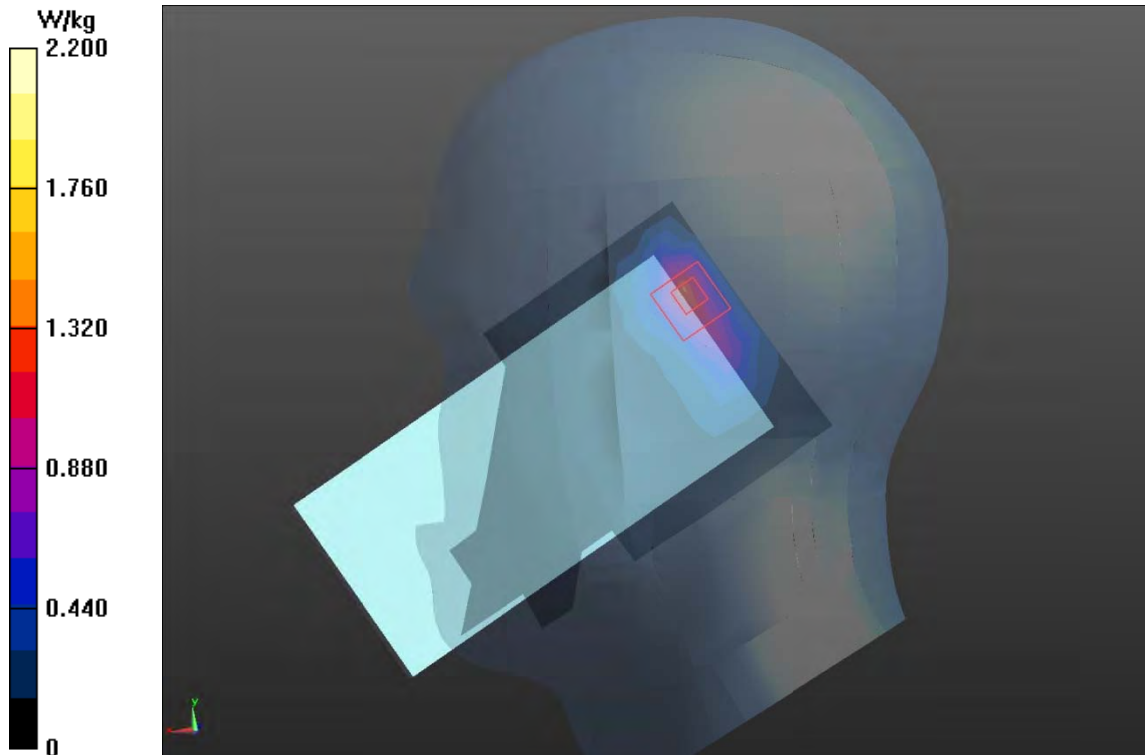
Left Tilt High/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 19.42 V/m; Power Drift = 0.022 dB

Peak SAR (extrapolated) = 2.86 W/kg

SAR(1 g) = 1.24 W/kg; SAR(10 g) = 0.550 W/kg

Maximum value of SAR (measured) = 2.20 W/kg



Plot 13 802.11n HT20 U-NII-1 Left Tilt Low

Date: 9/4/2021

Communication System: UID 0, 802.11n HT20 (0); Frequency: 5220 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 5220 \text{ MHz}$; $\sigma = 4.86 \text{ S/m}$; $\epsilon_r = 36.763$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature: $22.3 \text{ }^\circ\text{C}$ Liquid Temperature: 21.5°C

Phantom section: Left Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN7628; ConvF(5.51, 5.51, 5.51); Calibrated: 2/16/2021;

Electronics: DAE4 SN1317; Calibrated: 2/23/2021

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Left Tilt Low/Area Scan (12x21x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

Maximum value of SAR (measured) = 1.37 W/kg

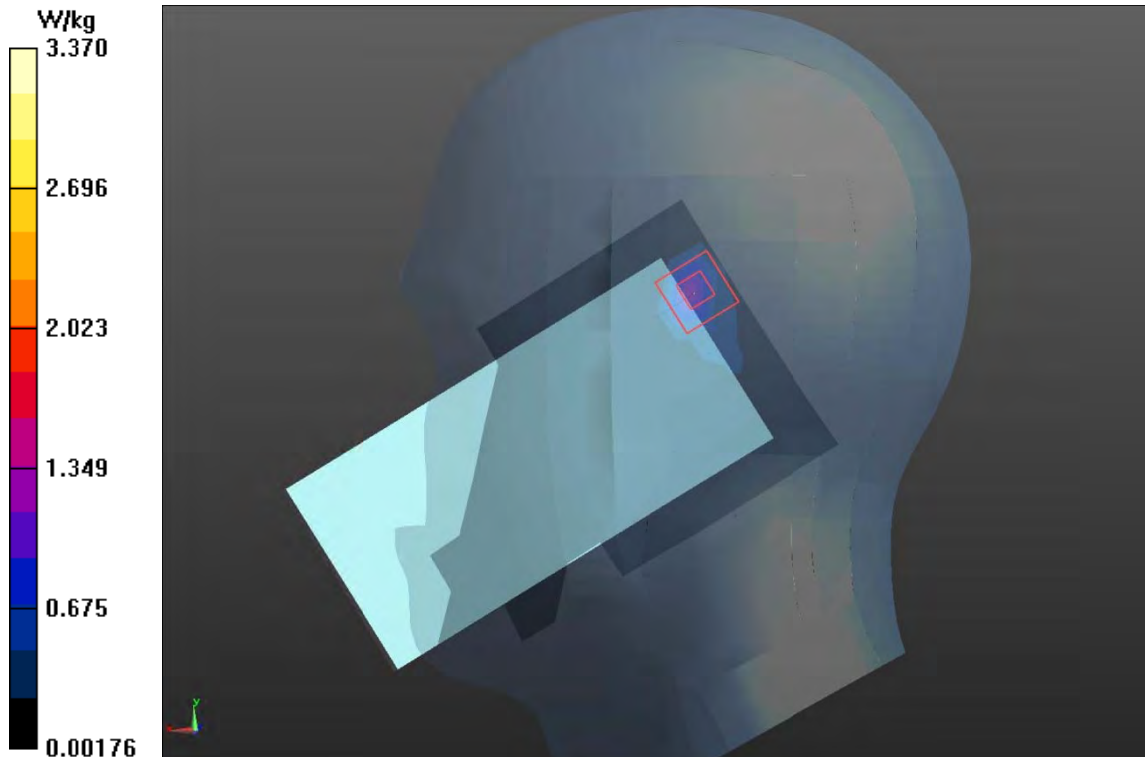
Left Tilt Low/Zoom Scan (7x7x12)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=2\text{mm}$

Reference Value = 9.050 V/m ; Power Drift = 0.020 dB

Peak SAR (extrapolated) = 5.73 W/kg

SAR(1 g) = 1.2 W/kg ; SAR(10 g) = 0.337 W/kg

Maximum value of SAR (measured) = 3.37 W/kg



Plot 14 802.11a U-NII-2A Left Tilt High

Date: 9/4/2021

Communication System: UID 0, 802.11a (0); Frequency: 5320 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 5320$ MHz; $\sigma = 4.95$ S/m; $\epsilon_r = 36.328$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5°C

Phantom section: Left Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN7628; ConvF(5.51, 5.51, 5.51); Calibrated: 2/16/2021;

Electronics: DAE4 SN1317; Calibrated: 2/23/2021

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Left Tilt High/Area Scan (12x21x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 2.02 W/kg

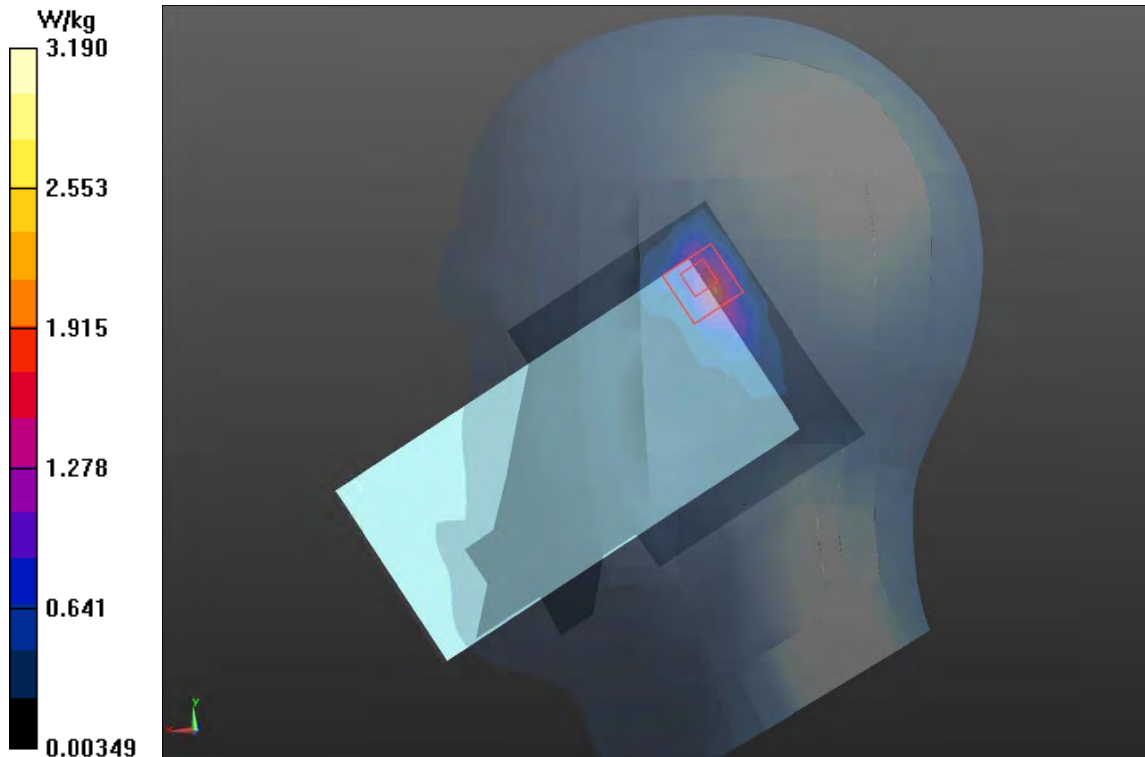
Left Tilt High/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 8.149 V/m; Power Drift = 0.19 dB

Peak SAR (extrapolated) = 5.61 W/kg

SAR(1 g) = 1.14 W/kg; SAR(10 g) = 0.343 W/kg

Maximum value of SAR (measured) = 3.19 W/kg



Plot 15 802.11a U-NII-2C Left Tilt Low

Date: 9/4/2021

Communication System: UID 0, 802.11a (0); Frequency: 5500 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 5500$ MHz; $\sigma = 5.183$ S/m; $\epsilon_r = 36.131$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5°C

Phantom section: Left Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN7628; ConvF(5.00, 5.00, 5.00); Calibrated: 2/16/2021;

Electronics: DAE4 SN1317; Calibrated: 2/23/2021

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Left Tilt Low/Area Scan (12x21x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 0.809 W/kg

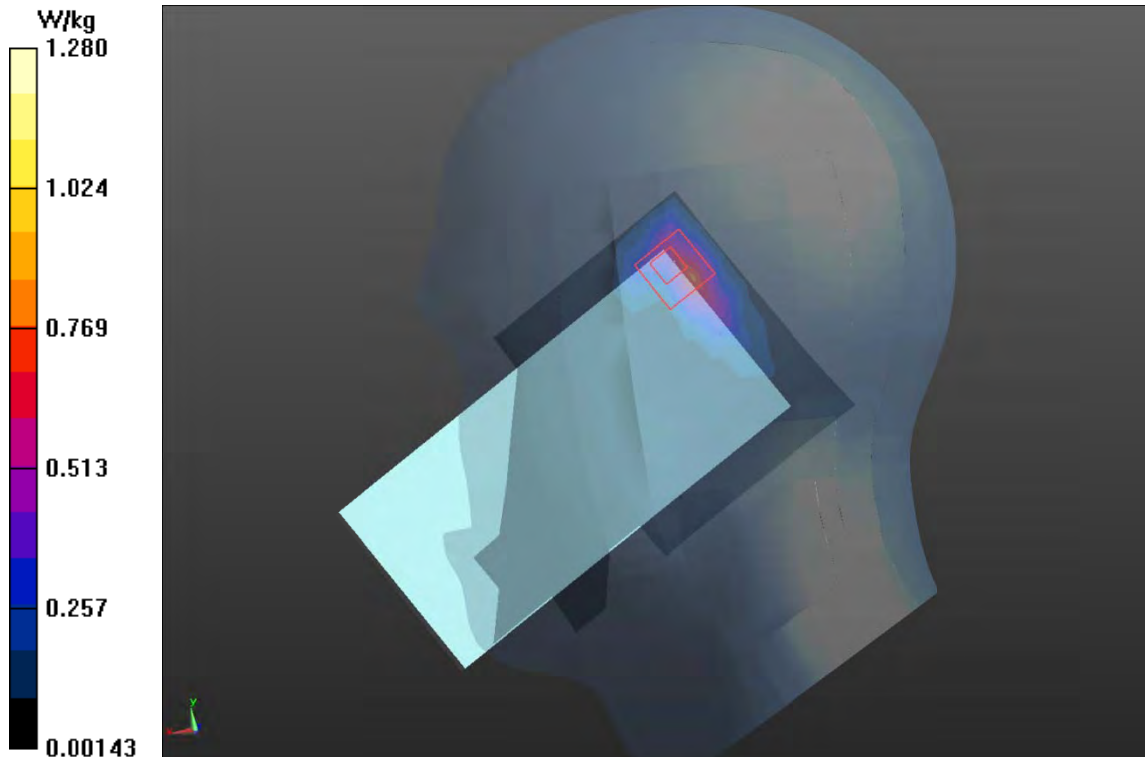
Left Tilt Low/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 4.911 V/m; Power Drift = 0.065 dB

Peak SAR (extrapolated) = 2.40 W/kg

SAR(1 g) = 0.491 W/kg; SAR(10 g) = 0.150 W/kg

Maximum value of SAR (measured) = 1.28 W/kg



Plot 16 Bluetooth Left Tilt Middle

Date: 8/21/2021

Communication System: UID 0, BT (0); Frequency: 2441 MHz; Duty Cycle: 1:1.3

Medium parameters used: $f = 2441$ MHz; $\sigma = 1.834$ S/m; $\epsilon_r = 37.585$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5°C

Phantom section: Left Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN7628; ConvF(8.01, 8.01, 8.01); Calibrated: 2/16/2021;

Electronics: DAE4 SN1317; Calibrated: 2/23/2021

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Left Tilt Middle/Area Scan (10x18x1): Measurement grid: dx=12mm, dy=12mm

Maximum value of SAR (measured) = 0.0746 W/kg

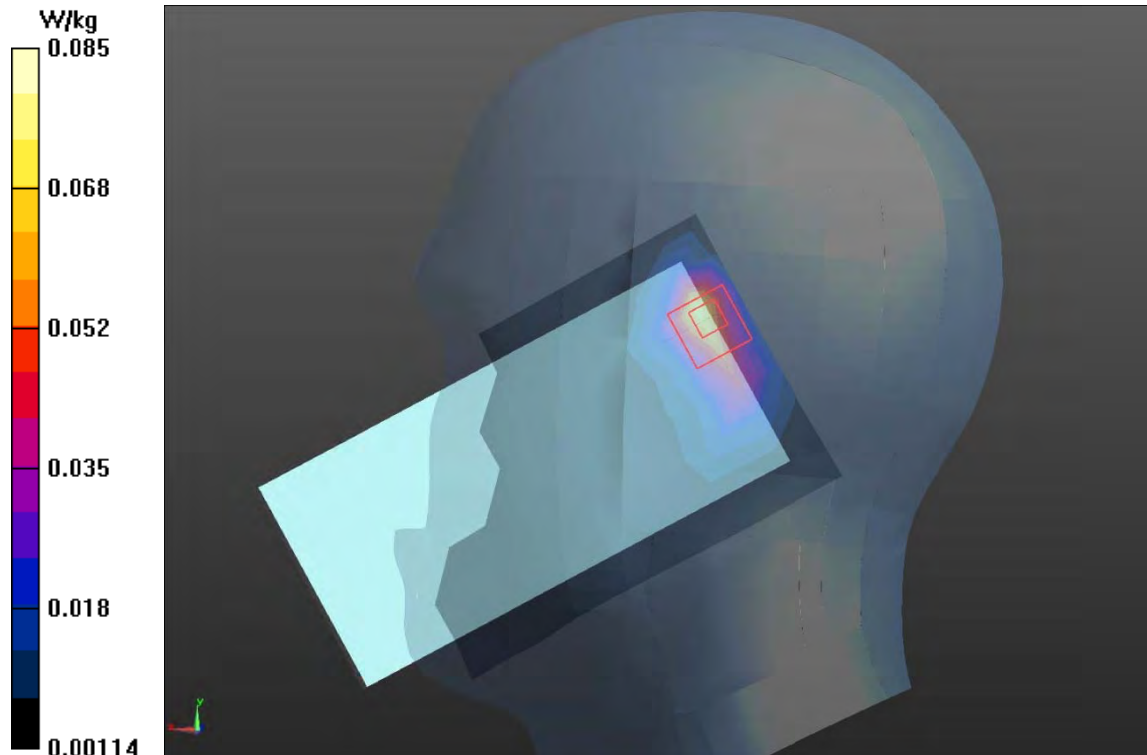
Left Tilt Middle/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 5.161 V/m; Power Drift = 0.059 dB

Peak SAR (extrapolated) = 0.178 W/kg

SAR(1 g) = 0.074 W/kg; SAR(10 g) = 0.033 W/kg

Maximum value of SAR (measured) = 0.085 W/kg



Plot 17 GSM 1900 Back Side Middle (Distance 15mm)

Date: 8/20/2021

Communication System: UID 0, GSM (0); Frequency: 1880 MHz; Duty Cycle: 1:8.30042

Medium parameters used: $f = 1880$ MHz; $\sigma = 1.42$ S/m; $\epsilon_r = 38.948$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN7628; ConvF(8.38, 8.38, 8.38); Calibrated: 2/16/2021;

Electronics: DAE4 SN1317; Calibrated: 2/23/2021

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Back Side Middle/Area Scan (8x14x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.389 W/kg

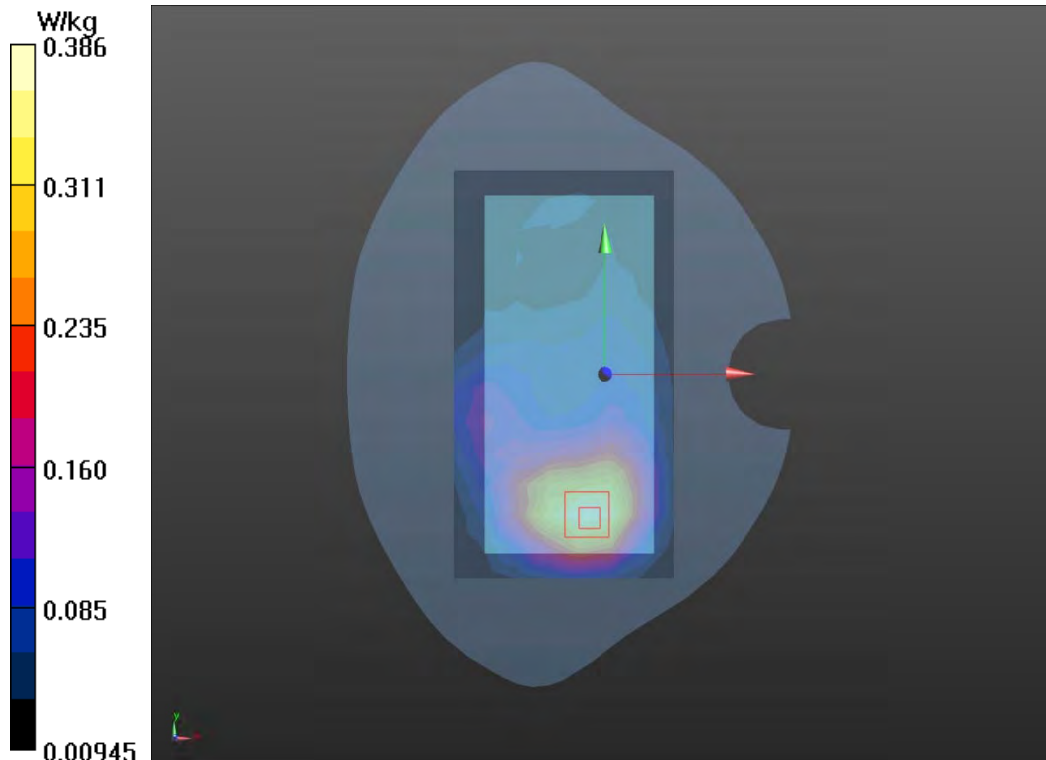
Back Side Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 5.881 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 0.458 W/kg

SAR(1 g) = 0.280 W/kg; SAR(10 g) = 0.174 W/kg

Maximum value of SAR (measured) = 0.386 W/kg



Plot 18 UMTS Band II Back Side Middle (Distance 15mm)

Date: 8/20/2021

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

Medium parameters used: $f = 1880 \text{ MHz}$; $\sigma = 1.42 \text{ S/m}$; $\epsilon_r = 38.948$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature: $22.3 \text{ }^\circ\text{C}$ Liquid Temperature: $21.5 \text{ }^\circ\text{C}$

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN7628; ConvF(8.38, 8.38, 8.38); Calibrated: 2/16/2021;

Electronics: DAE4 SN1317; Calibrated: 2/23/2021

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Back Side Middle/Area Scan (8x14x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (measured) = 0.432 W/kg

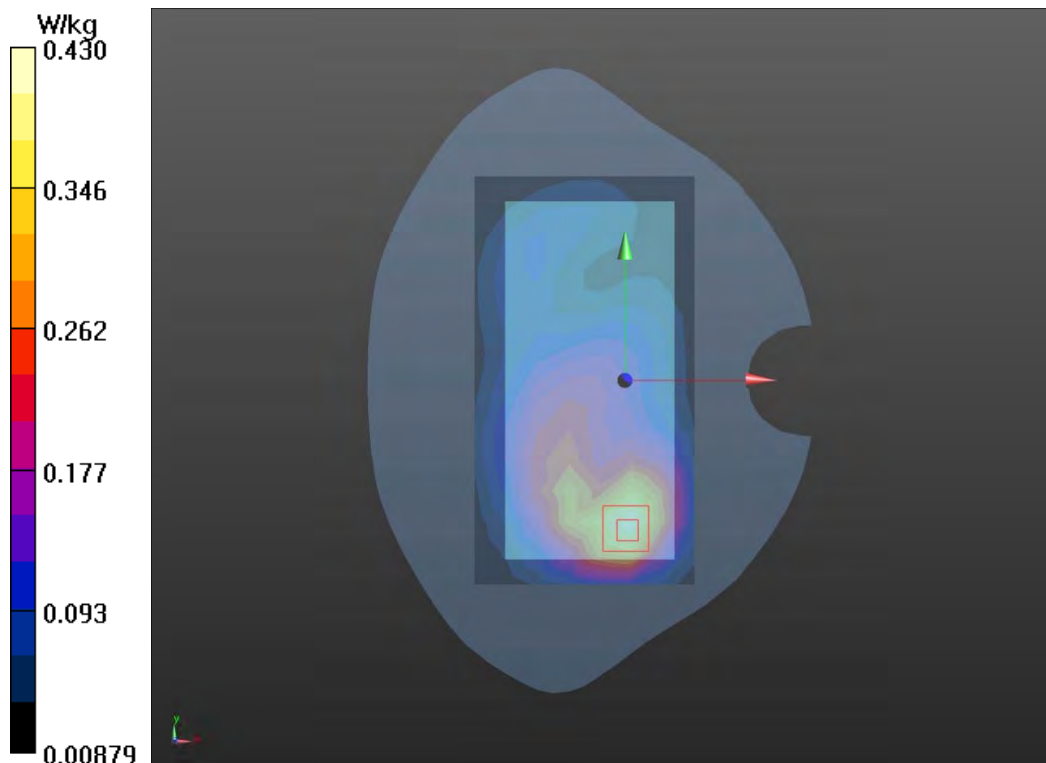
Back Side Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 11.81 V/m ; Power Drift = -0.09 dB

Peak SAR (extrapolated) = 0.657 W/kg

SAR(1 g) = 0.399 W/kg ; SAR(10 g) = 0.238 W/kg

Maximum value of SAR (measured) = 0.430 W/kg



Plot 19 UMTS Band IV Back Side Middle (Distance 15mm)

Date: 8/19/2021

Communication System: UID 0, WCDMA (0); Frequency: 1732.6 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 1733 \text{ MHz}$; $\sigma = 1.312 \text{ S/m}$; $\epsilon_r = 39.365$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature: $22.3 \text{ }^\circ\text{C}$ Liquid Temperature: $21.5 \text{ }^\circ\text{C}$

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN7628; ConvF(8.76, 8.76, 8.76); Calibrated: 2/16/2021;

Electronics: DAE4 SN1317; Calibrated: 2/23/2021

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Back Side Middle/Area Scan (8x14x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (measured) = 0.342 W/kg

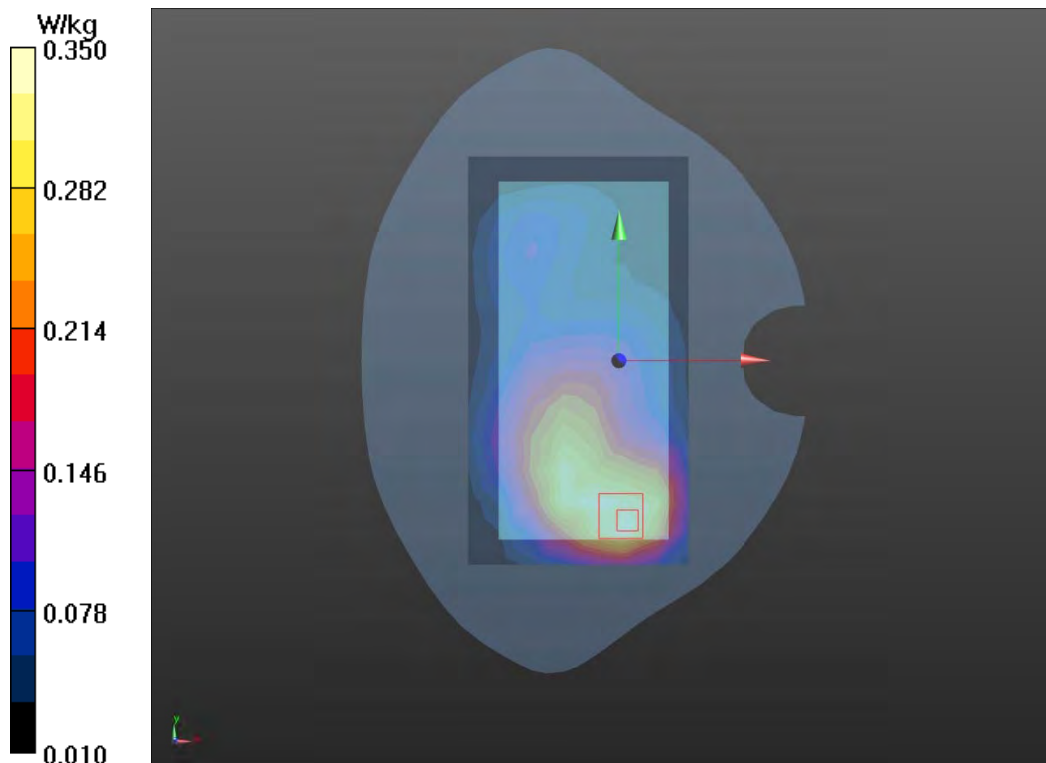
Back Side Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 10.64 V/m ; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 0.520 W/kg

SAR(1 g) = 0.329 W/kg ; SAR(10 g) = 0.207 W/kg

Maximum value of SAR (measured) = 0.350 W/kg



Plot 20 LTE Band 2 1RB Back Side Middle (Distance 15mm)

Date: 8/20/2021

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

Medium parameters used: $f = 1880$ MHz; $\sigma = 1.42$ S/m; $\epsilon_r = 38.948$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN7628; ConvF(8.38, 8.38, 8.38); Calibrated: 2/16/2021;

Electronics: DAE4 SN1317; Calibrated: 2/23/2021

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Back Side Middle/Area Scan (8x14x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.350 W/kg

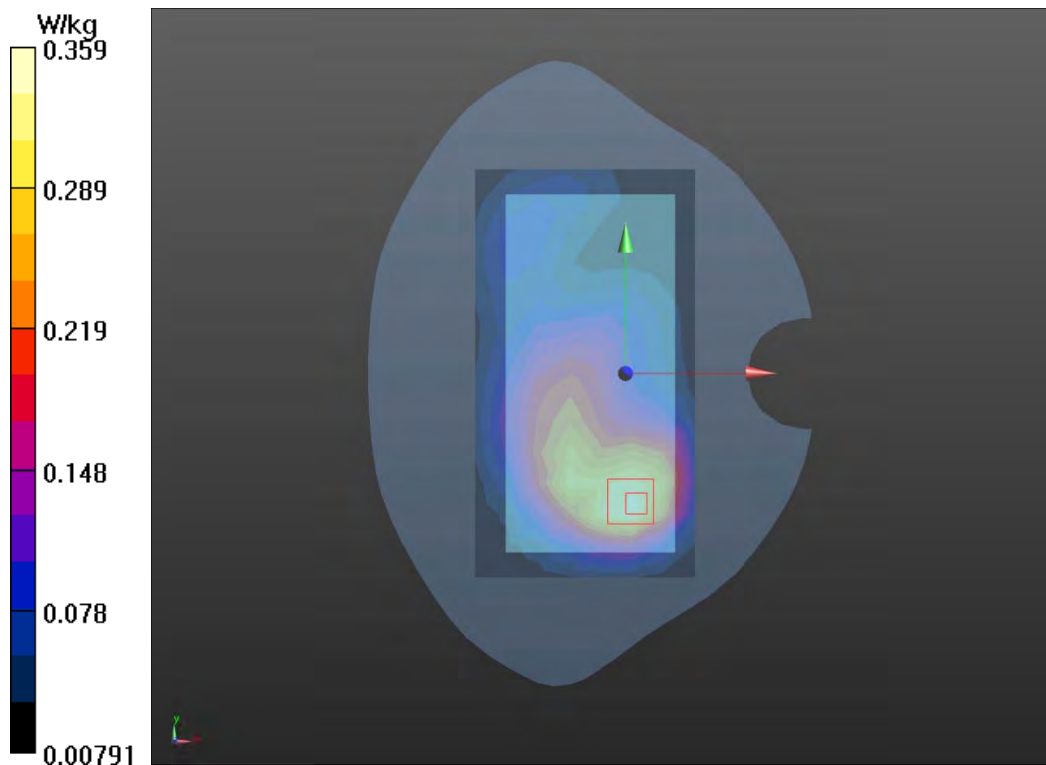
Back Side Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 11.34 V/m; Power Drift = 0.10 dB

Peak SAR (extrapolated) = 0.552 W/kg

SAR(1 g) = 0.337 W/kg; SAR(10 g) = 0.204 W/kg

Maximum value of SAR (measured) = 0.359 W/kg



Plot 21 LTE Band 41 1RB Back Side Low (Distance 15mm)

Date: 8/19/2021

Communication System: UID 0, LTE (0); Frequency: 2506 MHz; Duty Cycle: 1:1.58

Medium parameters used: $f = 2506$ MHz; $\sigma = 1.905$ S/m; $\epsilon_r = 37.414$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5°C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN7628; ConvF(7.71, 7.71, 7.71); Calibrated: 2/16/2021;

Electronics: DAE4 SN1317; Calibrated: 2/23/2021

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Back Side Low/Area Scan (10x18x1): Measurement grid: dx=12mm, dy=12mm

Maximum value of SAR (measured) = 0.419 W/kg

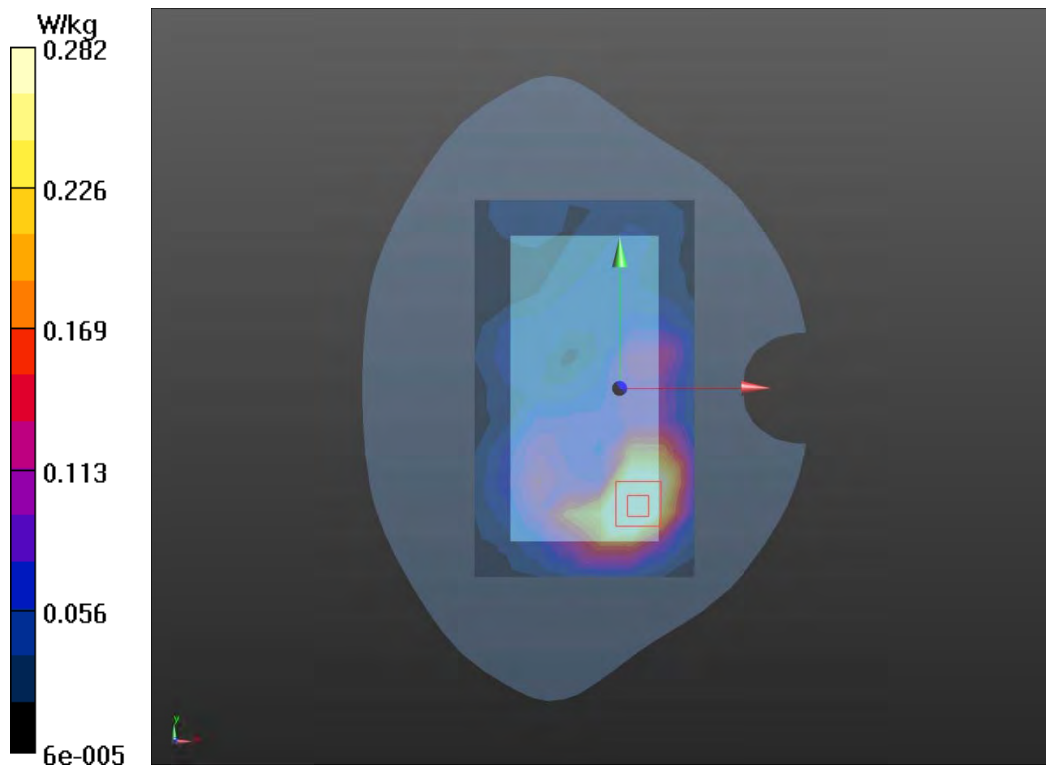
Back Side Low/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 4.208 V/m; Power Drift = -0.027 dB

Peak SAR (extrapolated) = 0.537 W/kg

SAR(1 g) = 0.278 W/kg; SAR(10 g) = 0.140 W/kg

Maximum value of SAR (measured) = 0.282 W/kg



Plot 22 802.11b Front Side Middle (Distance 15mm)

Date: 8/21/2021

Communication System: UID 0, 802.11b (0); Frequency: 2437 MHz; Duty Cycle: 1:1.02

Medium parameters used: $f = 2437 \text{ MHz}$; $\sigma = 1.831 \text{ S/m}$; $\epsilon_r = 37.663$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature: $22.3 \text{ }^\circ\text{C}$ Liquid Temperature: $21.5 \text{ }^\circ\text{C}$

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN7628; ConvF(8.01, 8.01, 8.01); Calibrated: 2/16/2021;

Electronics: DAE4 SN1317; Calibrated: 2/23/2021

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Front Side Middle/Area Scan (10x18x1): Measurement grid: $dx=12\text{mm}$, $dy=12\text{mm}$

Maximum value of SAR (measured) = 0.110 W/kg

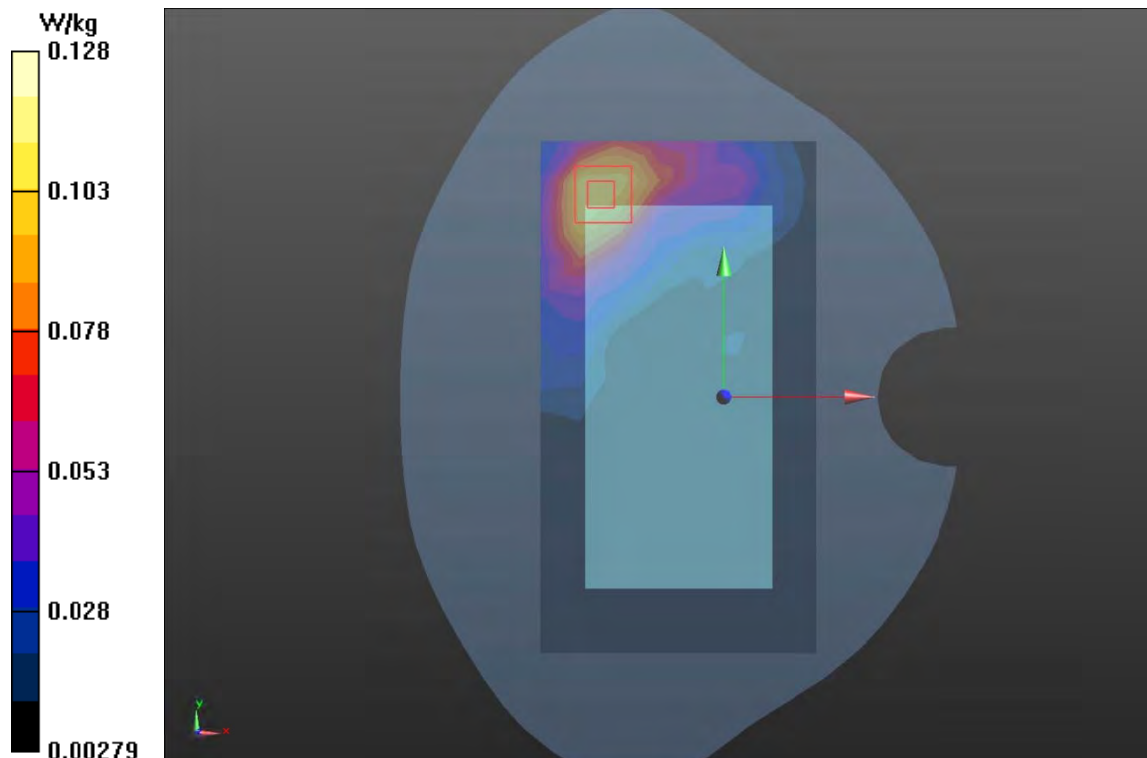
Front Side Middle/Zoom Scan(7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 1.709 V/m ; Power Drift = 0.03dB

Peak SAR (extrapolated) = 0.205 W/kg

SAR(1 g) = 0.119 W/kg ; SAR(10 g) = 0.069 W/kg

Maximum value of SAR (measured) = 0.128 W/kg



Plot 23 802.11n HT20 U-NII-1 Back Side High (Distance 15mm)

Date: 9/4/2021

Communication System: UID 0, 802.11n HT20 (0); Frequency: 5240 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 5240 \text{ MHz}$; $\sigma = 4.847 \text{ S/m}$; $\epsilon_r = 36.872$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature: $22.3 \text{ }^\circ\text{C}$ Liquid Temperature: $21.5 \text{ }^\circ\text{C}$

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN7628; ConvF(5.51, 5.51, 5.51); Calibrated: 2/16/2021;

Electronics: DAE4 SN1317; Calibrated: 2/23/2021

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Back Side High/Area Scan (12x21x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

Maximum value of SAR (measured) = 0.399 W/kg

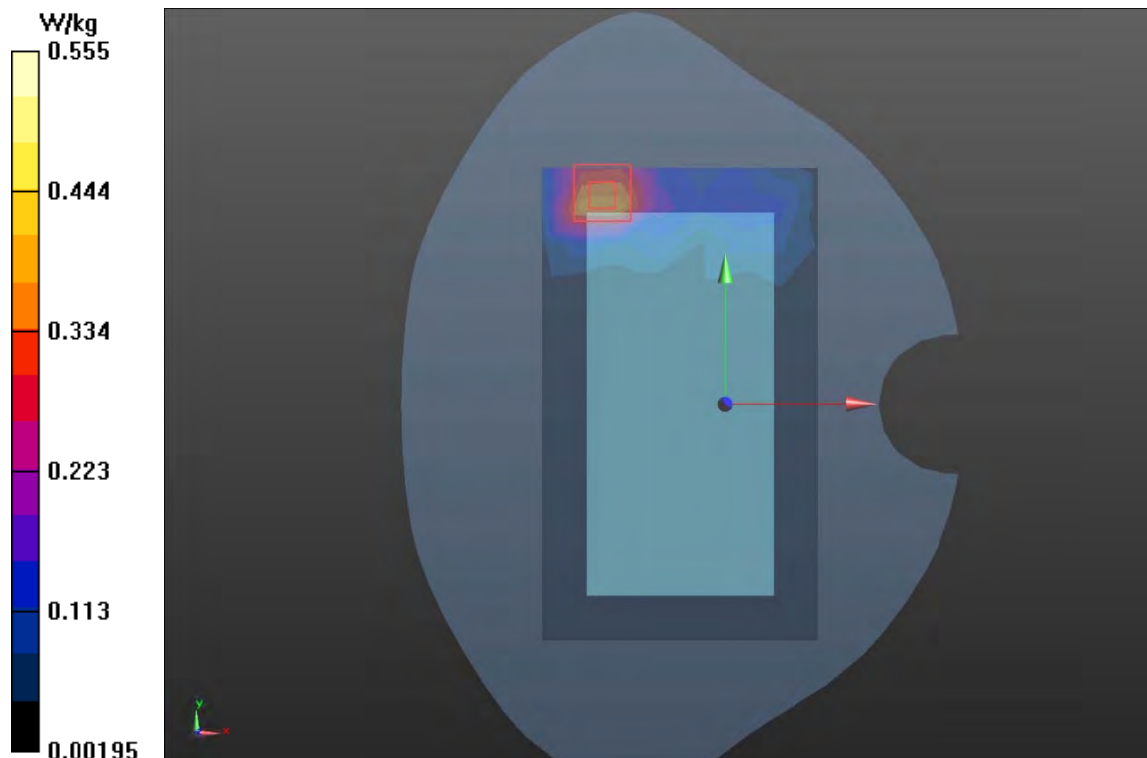
Back Side High/Zoom Scan (7x7x12)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=2\text{mm}$

Reference Value = 0.4720 V/m ; Power Drift = 0.081 dB

Peak SAR (extrapolated) = 0.937 W/kg

SAR(1 g) = 0.254 W/kg ; SAR(10 g) = 0.101 W/kg

Maximum value of SAR (measured) = 0.555 W/kg



Plot 24 802.11a U-NII-2A Back Side High (Distance 15mm)

Date: 9/4/2021

Communication System: UID 0, 802.11a (0); Frequency: 5320 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 5320$ MHz; $\sigma = 4.95$ S/m; $\epsilon_r = 36.328$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5°C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN7628; ConvF(5.51, 5.51, 5.51); Calibrated: 2/16/2021;

Electronics: DAE4 SN1317; Calibrated: 2/23/2021

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Back Side High/Area Scan (12x21x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 0.233 W/kg

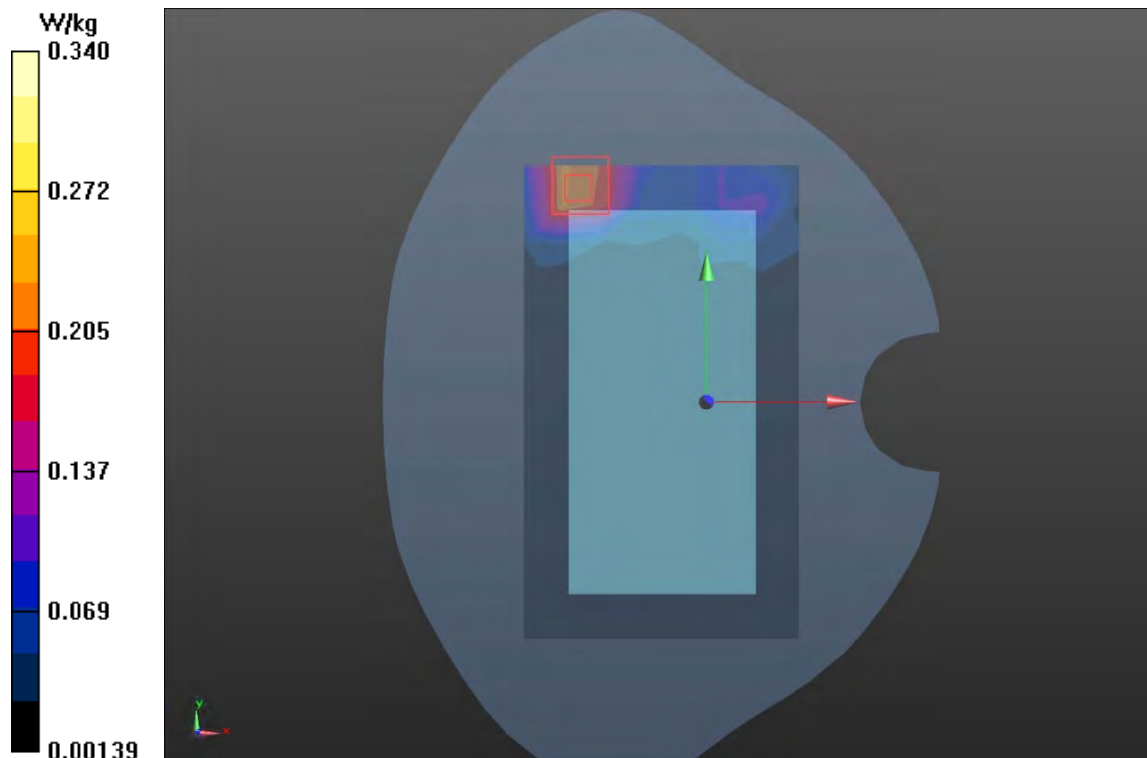
Back Side High/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 0 V/m; Power Drift = 0.1 dB

Peak SAR (extrapolated) = 0.575 W/kg

SAR(1 g) = 0.159 W/kg; SAR(10 g) = 0.064 W/kg

Maximum value of SAR (measured) = 0.340 W/kg



Plot 25 802.11a U-NII-2C Back Side Low (Distance 15mm)

Date: 9/4/2021

Communication System: UID 0, 802.11a (0); Frequency: 5500 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 5500 \text{ MHz}$; $\sigma = 5.183 \text{ S/m}$; $\epsilon_r = 36.131$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature: $22.3 \text{ }^\circ\text{C}$ Liquid Temperature: $21.5 \text{ }^\circ\text{C}$

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN7628; ConvF(5.00, 5.00, 5.00); Calibrated: 2/16/2021;

Electronics: DAE4 SN1317; Calibrated: 2/23/2021

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Back Side Low/Area Scan (12x21x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

Maximum value of SAR (measured) = 0.165 W/kg

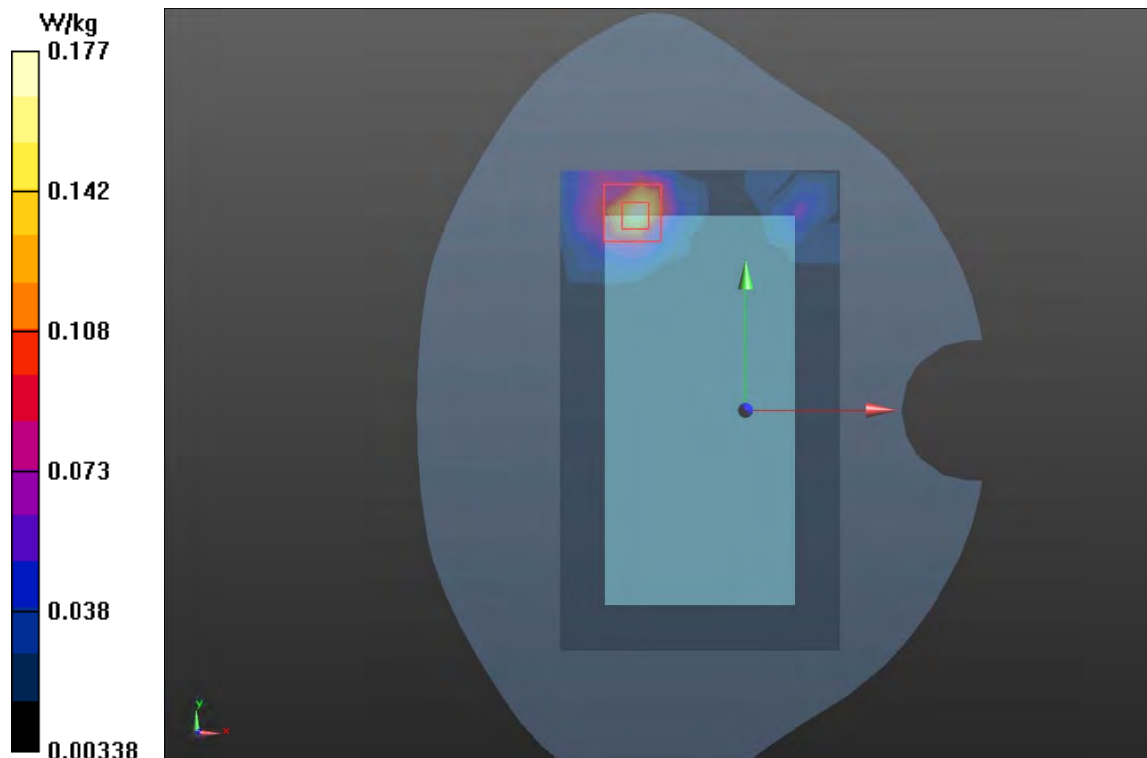
Back Side Low/Zoom Scan (7x7x12)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=2\text{mm}$

Reference Value = 0 V/m ; Power Drift = 0.1 dB

Peak SAR (extrapolated) = 0.338 W/kg

SAR(1 g) = 0.086 W/kg ; SAR(10 g) = 0.032 W/kg

Maximum value of SAR (measured) = 0.177 W/kg



Plot 26 GSM 1900 Bottom Edge Middle (Distance 10mm)

Date: 8/20/2021

Communication System: UID 0, GPRS 2TX (0); Frequency: 1880 MHz; Duty Cycle: 1:4.14954

Medium parameters used: $f = 1880 \text{ MHz}$; $\sigma = 1.42 \text{ S/m}$; $\epsilon_r = 38.948$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature: $22.3 \text{ }^\circ\text{C}$ Liquid Temperature: $21.5 \text{ }^\circ\text{C}$

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN7628; ConvF(8.38, 8.38, 8.38); Calibrated: 2/16/2021;

Electronics: DAE4 SN1317; Calibrated: 2/23/2021

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Bottom Edge Middle/Area Scan (4x8x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (measured) = 1.07 W/kg

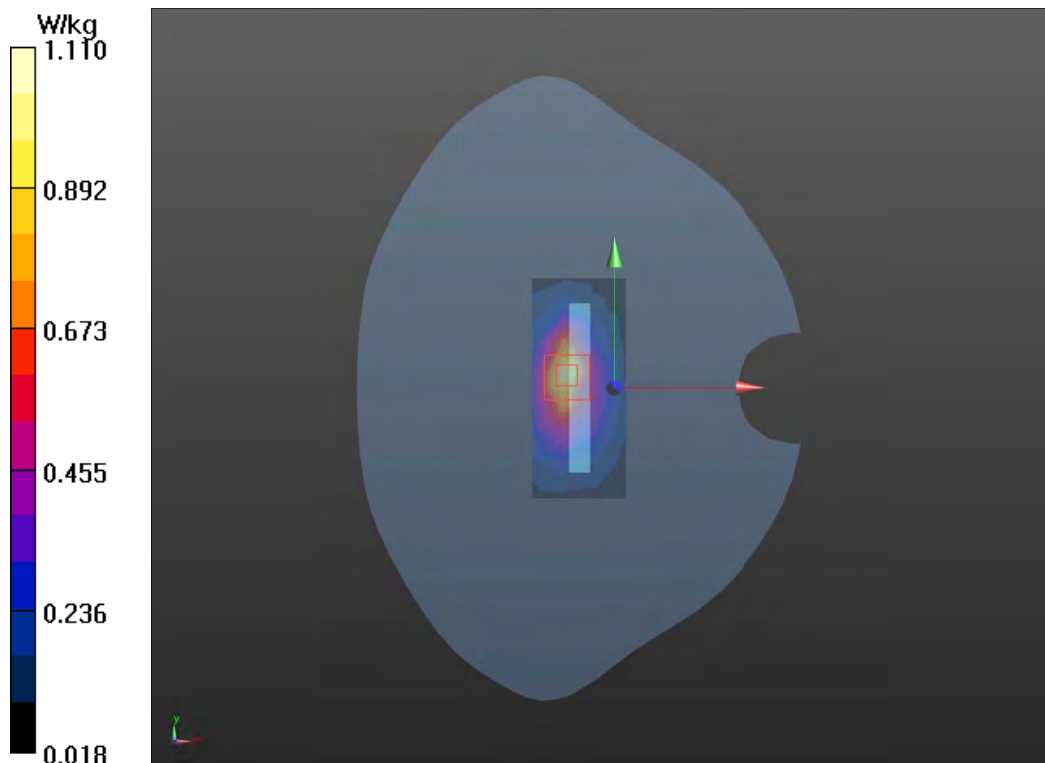
Bottom Edge Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 19.62 V/m ; Power Drift = 0.074 dB

Peak SAR (extrapolated) = 1.33 W/kg

SAR(1 g) = 0.718 W/kg ; SAR(10 g) = 0.381 W/kg

Maximum value of SAR (measured) = 1.11 W/kg



Plot 27 UMTS Band II Bottom Edge High (Distance 10mm)

Date: 8/20/2021

Communication System: UID 0, WCDMA (0); Frequency: 1907.6 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 1908 \text{ MHz}$; $\sigma = 1.44 \text{ S/m}$; $\epsilon_r = 38.828$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature: $22.3 \text{ }^\circ\text{C}$ Liquid Temperature: $21.5 \text{ }^\circ\text{C}$

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN7628; ConvF(8.38, 8.38, 8.38); Calibrated: 2/16/2021;

Electronics: DAE4 SN1317; Calibrated: 2/23/2021

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Bottom Edge High/Area Scan (4x8x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (measured) = 0.934 W/kg

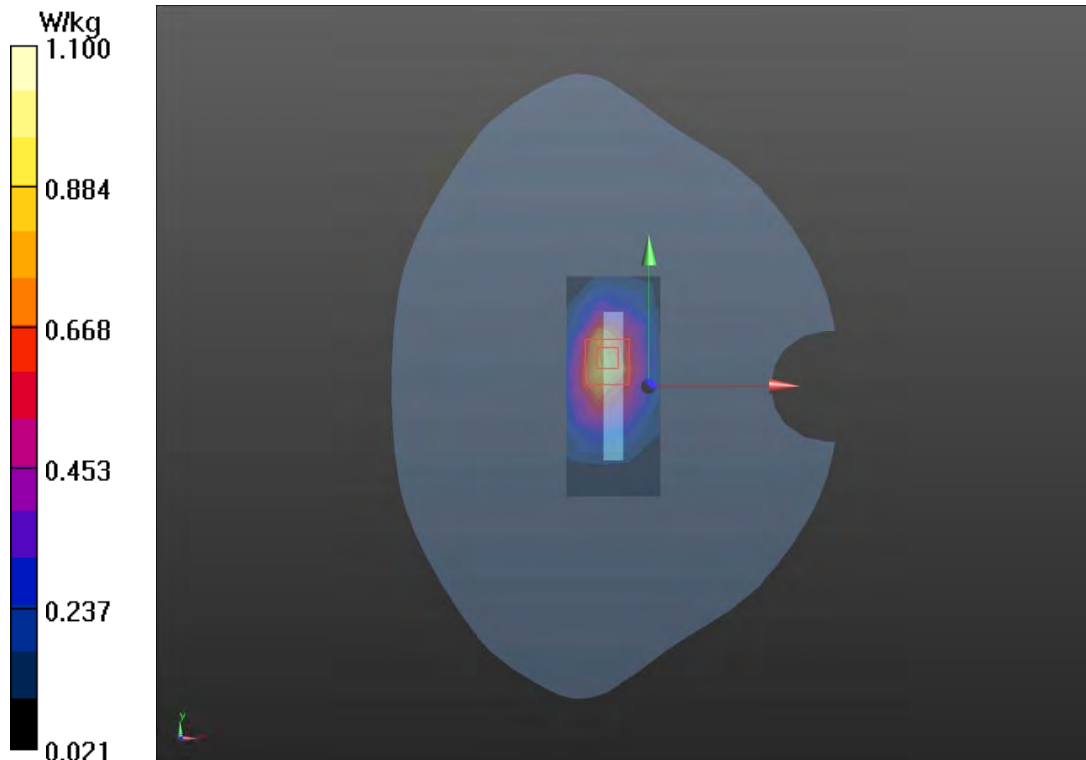
Bottom Edge High/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 24.54 V/m ; Power Drift = 0.13 dB

Peak SAR (extrapolated) = 1.78 W/kg

SAR(1 g) = 0.982 W/kg ; SAR(10 g) = 0.529 W/kg

Maximum value of SAR (measured) = 1.10 W/kg



Plot 28 UMTS Band IV Bottom Edge High (Distance 10mm)

Date: 8/19/2021

Communication System: UID 0, WCDMA (0); Frequency: 1752.6 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 1753 \text{ MHz}$; $\sigma = 1.329 \text{ S/m}$; $\epsilon_r = 39.357$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature: $22.3 \text{ }^\circ\text{C}$ Liquid Temperature: $21.5 \text{ }^\circ\text{C}$

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN7628; ConvF(8.76, 8.76, 8.76); Calibrated: 2/16/2021;

Electronics: DAE4 SN1317; Calibrated: 2/23/2021

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Bottom Edge High/Area Scan (4x8x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (measured) = 0.882 W/kg

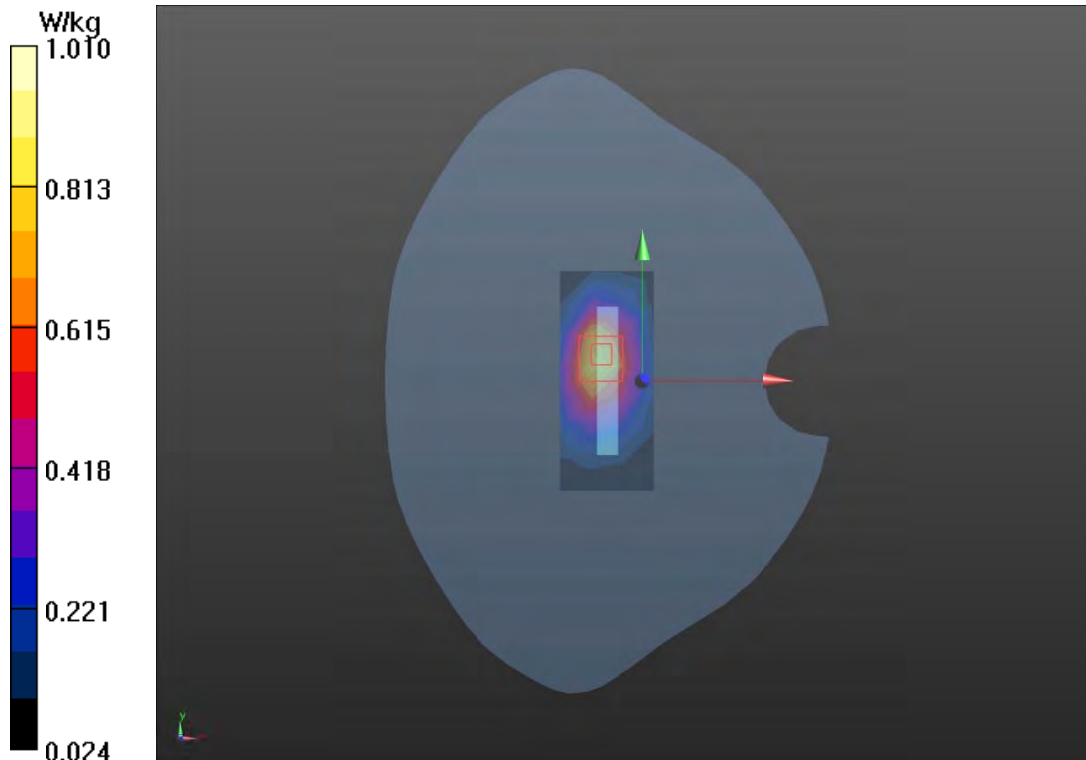
Bottom Edge High/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 24.90 V/m ; Power Drift = 0.12 dB

Peak SAR (extrapolated) = 1.56 W/kg

SAR(1 g) = 0.905 W/kg ; SAR(10 g) = 0.505 W/kg

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



Plot 29 LTE Band 2 1RB Bottom Edge High (Distance 10mm)

Date: 8/20/2021

Communication System: UID 0, LTE (0); Frequency: 1900 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.434$ S/m; $\epsilon_r = 38.861$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN7628; ConvF(8.38, 8.38, 8.38); Calibrated: 2/16/2021;

Electronics: DAE4 SN1317; Calibrated: 2/23/2021

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Bottom Edge High/Area Scan (4x8x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.860 W/kg

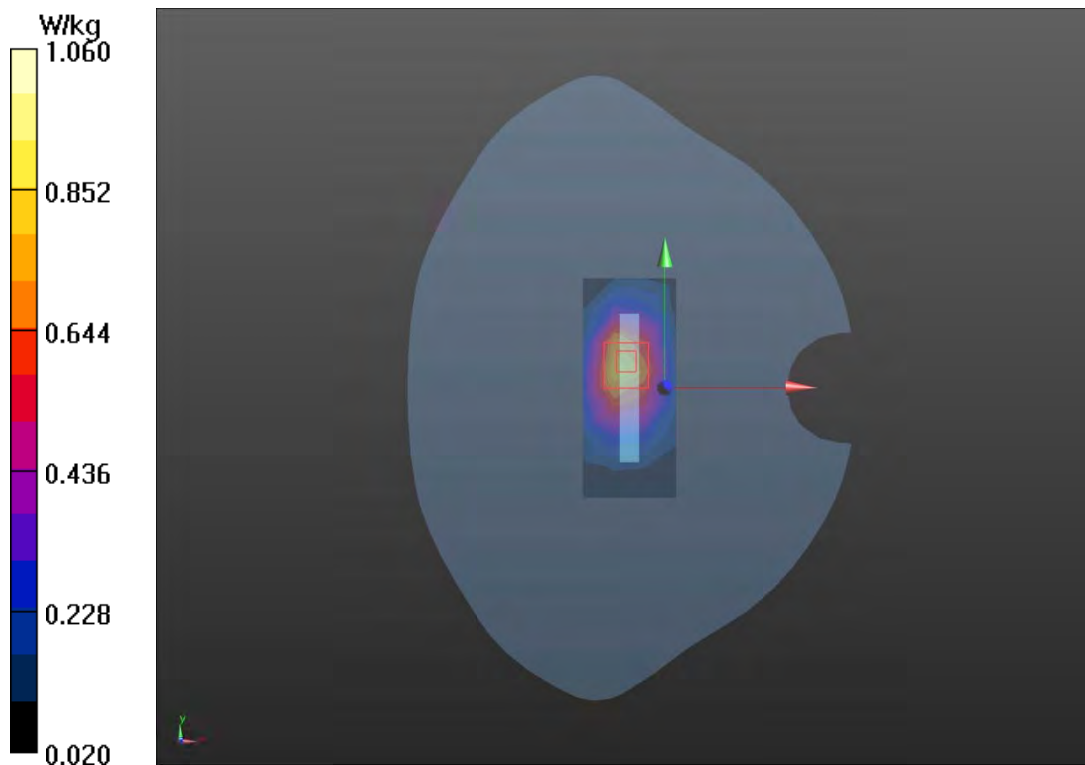
Bottom Edge High/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 24.62 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 1.71 W/kg

SAR(1 g) = 0.947 W/kg; SAR(10 g) = 0.512 W/kg

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



Plot 30 LTE Band 41 1RB Back Side Low (Distance 10mm)

Date: 8/19/2021

Communication System: UID 0, LTE (0); Frequency: 2506 MHz; Duty Cycle: 1:1.58

Medium parameters used: $f = 2506$ MHz; $\sigma = 1.905$ S/m; $\epsilon_r = 37.414$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5°C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN7628; ConvF(7.71, 7.71, 7.71); Calibrated: 2/16/2021;

Electronics: DAE4 SN1317; Calibrated: 2/23/2021

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Back Side Low/Area Scan (10x18x1): Measurement grid: dx=12mm, dy=12mm

Maximum value of SAR (measured) = 0.677 W/kg

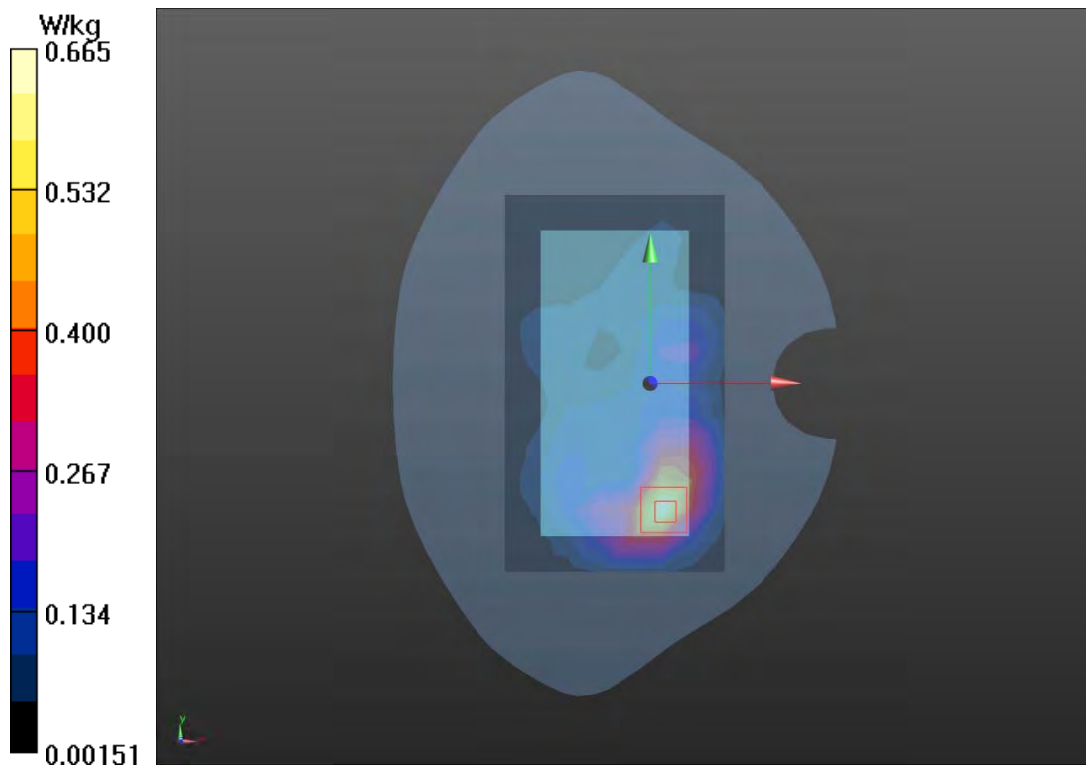
Back Side Low/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 5.017 V/m; Power Drift = 0.19 dB

Peak SAR (extrapolated) = 0.884 W/kg

SAR(1 g) = 0.444 W/kg; SAR(10 g) = 0.216 W/kg

Maximum value of SAR (measured) = 0.665 W/kg



Plot 31 802.11b Top Edge Middle (Distance 10mm)

Date: 8/21/2021

Communication System: UID 0, 802.11b (0); Frequency: 2437 MHz; Duty Cycle: 1:1.02

Medium parameters used: $f = 2437 \text{ MHz}$; $\sigma = 1.831 \text{ S/m}$; $\epsilon_r = 37.663$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature: $22.3 \text{ }^\circ\text{C}$ Liquid Temperature: 21.5°C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN7628; ConvF(8.01, 8.01, 8.01); Calibrated: 2/16/2021;

Electronics: DAE4 SN1317; Calibrated: 2/23/2021

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Top Edge Middle/Area Scan(10x18x1): Measurement grid: $dx=12\text{mm}$, $dy=12\text{mm}$

Maximum value of SAR (measured) = 0.472 W/kg

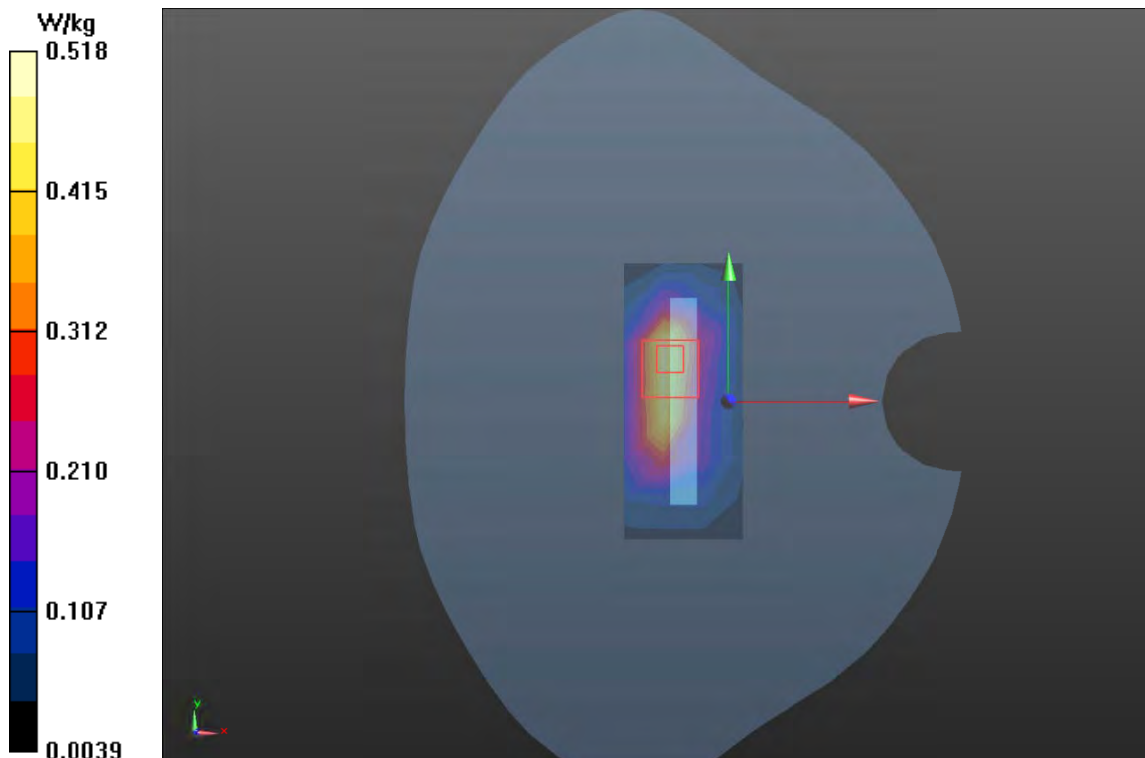
Top Edge Middle/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 11.99 V/m ; Power Drift = 0.044 dB

Peak SAR (extrapolated) = 0.645 W/kg

SAR(1 g) = 0.321 W/kg ; SAR(10 g) = 0.163 W/kg

Maximum value of SAR (measured) = 0.518 W/kg



Plot 32 802.11n HT20 U-NII-1 Top Edge High (Distance 10mm)

Date: 9/4/2021

Communication System: UID 0, 802.11n HT20 (0); Frequency: 5240 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 5240 \text{ MHz}$; $\sigma = 4.847 \text{ S/m}$; $\epsilon_r = 36.872$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature: $22.3 \text{ }^\circ\text{C}$ Liquid Temperature: 21.5°C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN7628; ConvF(5.51, 5.51, 5.51); Calibrated: 2/16/2021;

Electronics: DAE4 SN1317; Calibrated: 2/23/2021

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Top Edge High/Area Scan (6x12x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

Maximum value of SAR (measured) = 0.750 W/kg

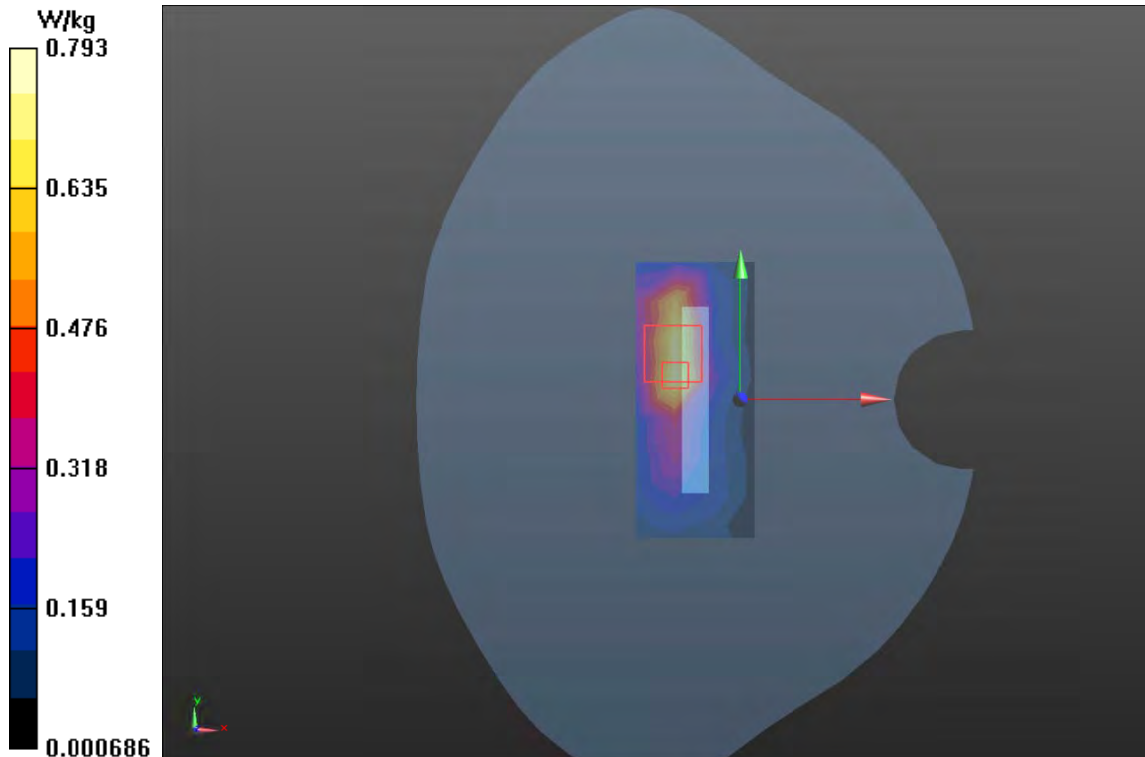
Top Edge High/Zoom Scan (7x7x12)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=2\text{mm}$

Reference Value = 5.767 V/m ; Power Drift = 0.090 dB

Peak SAR (extrapolated) = 1.36 W/kg

SAR(1 g) = 0.368 W/kg ; SAR(10 g) = 0.152 W/kg

Maximum value of SAR (measured) = 0.793 W/kg



Plot 33 802.11a U-NII-2A Back Side High (Distance 10mm)

Date: 9/4/2021

Communication System: UID 0, 802.11a (0); Frequency: 5320 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 5320$ MHz; $\sigma = 4.95$ S/m; $\epsilon_r = 36.328$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5°C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN7628; ConvF(5.51, 5.51, 5.51); Calibrated: 2/16/2021;

Electronics: DAE4 SN1317; Calibrated: 2/23/2021

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Back Side High/Area Scan (12x21x1): Measurement grid: dx=10mm, dy=10mm

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

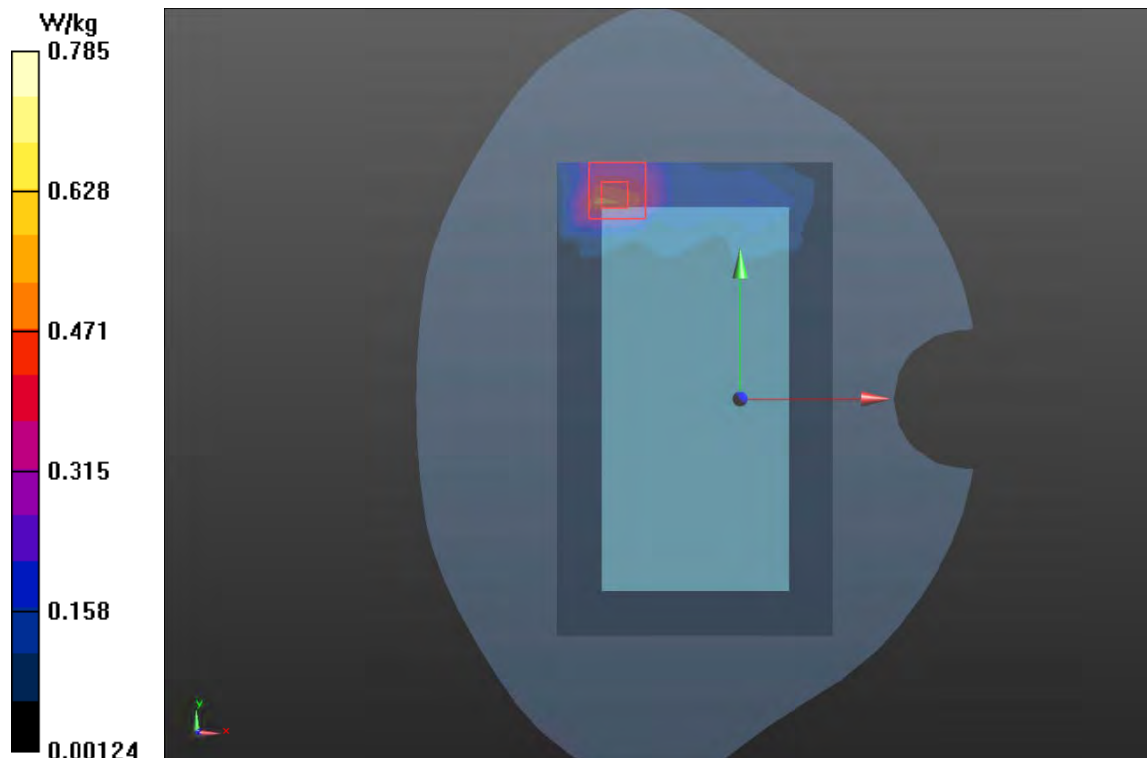
Back Side High/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 0 V/m; Power Drift = 0.100 dB

Peak SAR (extrapolated) = 1.38 W/kg

SAR(1 g) = 0.342 W/kg; SAR(10 g) = 0.124 W/kg

Maximum value of SAR (measured) = 0.785 W/kg



Plot 34 802.11a U-NII-2C Back Side Low (Distance 10mm)

Date: 9/4/2021

Communication System: UID 0, 802.11a (0); Frequency: 5500 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 5500 \text{ MHz}$; $\sigma = 5.183 \text{ S/m}$; $\epsilon_r = 36.131$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature: $22.3 \text{ }^\circ\text{C}$ Liquid Temperature: $21.5 \text{ }^\circ\text{C}$

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN7628; ConvF(5.00, 5.00, 5.00); Calibrated: 2/16/2021;

Electronics: DAE4 SN1317; Calibrated: 2/23/2021

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Back Side Low/Area Scan (12x21x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

Maximum value of SAR (measured) = 0.390 W/kg

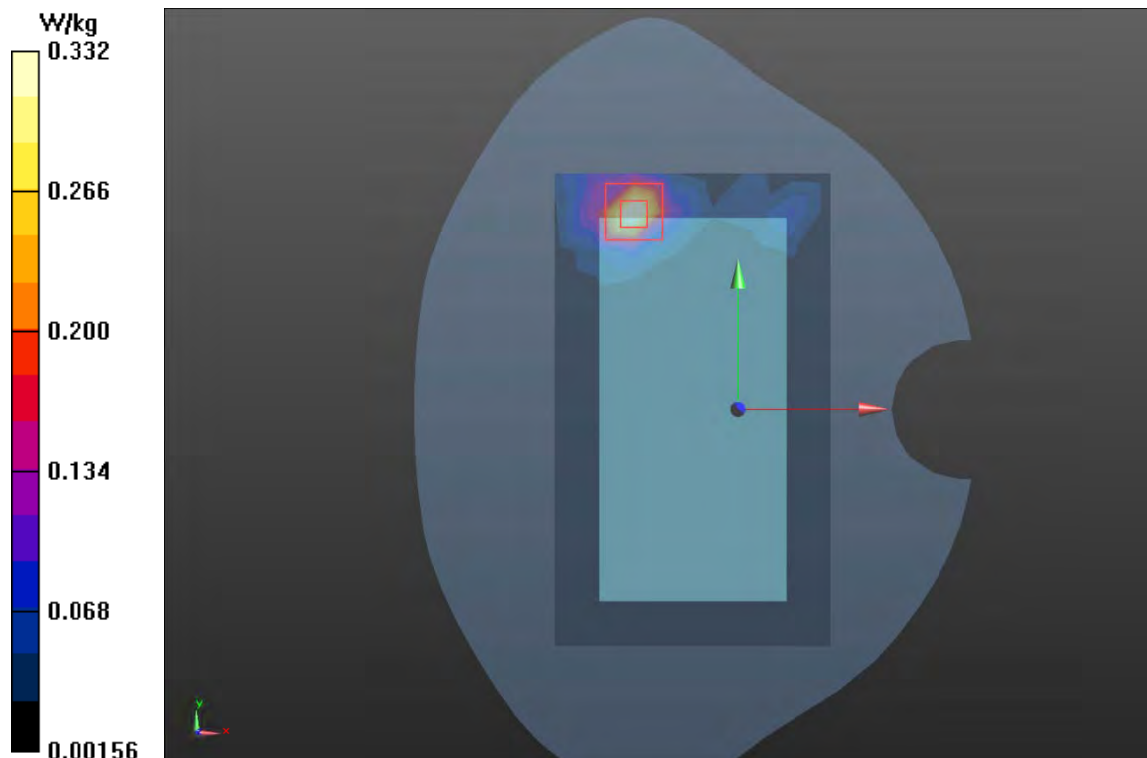
Back Side Low/Zoom Scan ((7x7x12)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=2\text{mm}$

Reference Value = 0 V/m ; Power Drift = 0.100 dB

Peak SAR (extrapolated) = 0.703 W/kg

SAR(1 g) = 0.164 W/kg ; SAR(10 g) = 0.058 W/kg

Maximum value of SAR (measured) = 0.332 W/kg



Plot 35 Bluetooth Top Edge Middle (Distance 10mm)

Date: 8/21/2021

Communication System: UID 0, BT (0); Frequency: 2441 MHz; Duty Cycle: 1:1.3

Medium parameters used: $f = 2441$ MHz; $\sigma = 1.834$ S/m; $\epsilon_r = 37.585$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN7628; ConvF(8.01, 8.01, 8.01); Calibrated: 2/16/2021;

Electronics: DAE4 SN1317; Calibrated: 2/23/2021

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Top Edge Middle/Area Scan (10x18x1): Measurement grid: dx=12mm, dy=12mm

Maximum value of SAR (measured) = 0.0461 W/kg

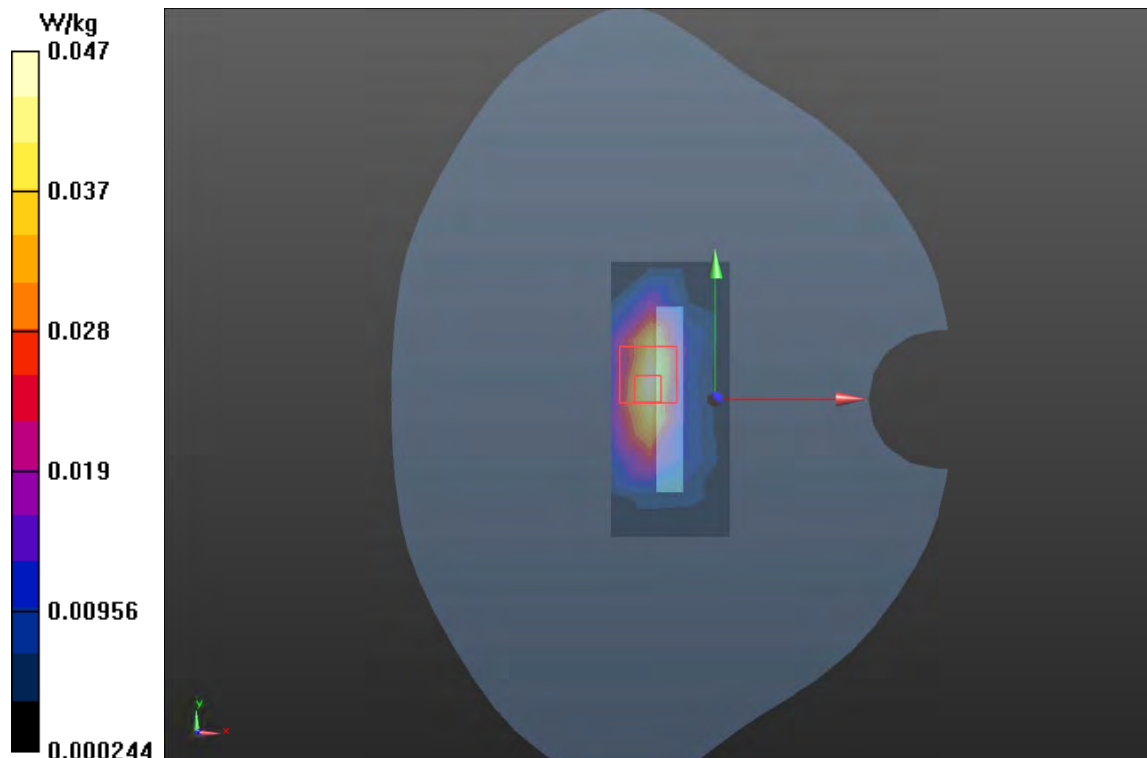
Top Edge Middle/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 3.314 V/m; Power Drift = 0.116 dB

Peak SAR (extrapolated) = 0.0630 W/kg

SAR(1 g) = 0.029 W/kg; SAR(10 g) = 0.014 W/kg

Maximum value of SAR (measured) = 0.047 W/kg



ANNEX D: Probe Calibration Certificate

**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: **Auden**

Certificate No.: **EX3-7628_Feb21**

CALIBRATION CERTIFICATE	
Object	EX3DV4 - SN:7628
Calibration procedure(s)	QA CAL-01.v9, QA CAL-14.v6, QA CAL-23.v5, QA CAL-25.v7 Calibration procedure for dosimetric E-field probes
Calibration date:	February 16, 2021
<p>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.</p> <p>All calibrations have been conducted in the closed laboratory facility; environment temperature (22 ± 3)°C and humidity < 70%.</p> <p>Calibration Equipment used (M&TE critical for calibration)</p>	

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	01-Apr-20 (No. 217-03100/03101)	Apr-21
Power sensor NRP-Z91	SN: 103244	01-Apr-20 (No. 217-03100)	Apr-21
Power sensor NRP-Z91	SN: 103245	01-Apr-20 (No. 217-03101)	Apr-21
Reference 20 dB Attenuator	SN: CC2552 (20x)	31-Mar-20 (No. 217-03106)	Apr-21
DAE4	SN: 660	23-Dec-20 (No. DAE4-660_Dec20)	Dec-21
Reference Probe ES3DV2	SN: 3013	30-Dec-20 (No. ES3-3013_Dec20)	Dec-21
Secondary Standards	ID	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB41293874	06-Apr-16 (in house check Jun-20)	In house check: Jun-22
Power sensor E4412A	SN: MY41498087	06-Apr-16 (in house check Jun-20)	In house check: Jun-22
Power sensor E4412A	SN: 000110210	06-Apr-16 (in house check Jun-20)	In house check: Jun-22
RF generator HP 8648C	SN: US3642U01700	04-Aug-99 (in house check Jun-20)	In house check: Jun-22
Network Analyzer E8358A	SN: US41080477	31-Mar-14 (in house check Oct-20)	In house check: Oct-21

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	
			Issued: February 16, 2021
This calibration certificate shall not be reproduced except in full without written approval of the laboratory.			

**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)

Accreditation No.: SCS 0108

The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Glossary:

TSL	tissue simulating liquid
NORM _{x,y,z}	sensitivity in free space
ConvF	sensitivity in TSL / NORM _{x,y,z}
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C, D	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\vartheta = 0$ is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

- a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- b) IEC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
- c) IEC 62209-2, "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)", March 2010
- d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Methods Applied and Interpretation of Parameters:

- **NORM_{x,y,z}**: Assessed for E-field polarization $\vartheta = 0$ ($f \leq 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). NORM_{x,y,z} are only intermediate values, i.e., the uncertainties of NORM_{x,y,z} does not affect the E²-field uncertainty inside TSL (see below ConvF).
- **NORM(f)_{x,y,z}** = NORM_{x,y,z} * frequency_response (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of ConvF.
- **DCP_{x,y,z}**: DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- **PAR**: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- **A_{x,y,z}; B_{x,y,z}; C_{x,y,z}; D_{x,y,z}; VR_{x,y,z}**: A, B, C, D are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- **ConvF and Boundary Effect Parameters**: Assessed in flat phantom using E-field (or Temperature Transfer Standard for $f \leq 800$ MHz) and inside waveguide using analytical field distributions based on power measurements for $f > 800$ MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORM_{x,y,z} * ConvF whereby the uncertainty corresponds to that given for ConvF. A frequency dependent ConvF is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- **Spherical isotropy (3D deviation from isotropy)**: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- **Sensor Offset**: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- **Connector Angle**: The angle is assessed using the information gained by determining the NORM_x (no uncertainty required).



EX3DV4 – SN:7628

February 16, 2021

DASY/EASY - Parameters of Probe: EX3DV4 - SN:7628**Basic Calibration Parameters**

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu\text{V}/(\text{V}/\text{m})^2$) ^A	0.61	0.56	0.61	± 10.1 %
DCP (mV) ^B	109.2	108.2	109.0	

Calibration Results for Modulation Response

UID	Communication System Name		A dB	B dB μV	C	D dB	VR mV	Max dev.	Max Unc ^E (k=2)
0	CW	X	0.00	0.00	1.00	0.00	149.4	± 2.7 %	± 4.7 %
		Y	0.00	0.00	1.00		155.2		
		Z	0.00	0.00	1.00		166.3		
10352-AAA	Pulse Waveform (200Hz, 10%)	X	1.78	61.75	7.06	10.00	60.0	± 2.9 %	± 9.6 %
		Y	1.55	60.76	6.50		60.0		
		Z	1.58	60.81	6.57		60.0		
10353-AAA	Pulse Waveform (200Hz, 20%)	X	0.85	60.00	5.15	6.99	80.0	± 2.3 %	± 9.6 %
		Y	0.85	60.00	5.03		80.0		
		Z	0.79	60.00	4.98		80.0		
10354-AAA	Pulse Waveform (200Hz, 40%)	X	0.44	60.00	4.18	3.98	95.0	± 2.5 %	± 9.6 %
		Y	8.00	70.00	7.00		95.0		
		Z	0.10	132.92	0.43		95.0		
10355-AAA	Pulse Waveform (200Hz, 60%)	X	0.26	60.00	3.63	2.22	120.0	± 1.6 %	± 9.6 %
		Y	10.15	157.55	9.99		120.0		
		Z	7.49	159.80	25.97		120.0		
10387-AAA	QPSK Waveform, 1 MHz	X	0.71	69.02	16.11	1.00	150.0	± 3.3 %	± 9.6 %
		Y	0.53	63.89	12.42		150.0		
		Z	0.53	63.57	12.67		150.0		
10388-AAA	QPSK Waveform, 10 MHz	X	1.60	69.56	15.90	0.00	150.0	± 1.1 %	± 9.6 %
		Y	1.33	66.14	13.93		150.0		
		Z	1.33	66.05	14.03		150.0		
10396-AAA	64-QAM Waveform, 100 kHz	X	1.78	65.59	16.29	3.01	150.0	± 1.0 %	± 9.6 %
		Y	1.71	64.82	15.85		150.0		
		Z	1.57	63.48	15.49		150.0		
10399-AAA	64-QAM Waveform, 40 MHz	X	2.93	67.49	15.80	0.00	150.0	± 1.4 %	± 9.6 %
		Y	2.81	66.48	15.12		150.0		
		Z	2.80	66.27	15.10		150.0		
10414-AAA	WLAN CCDF, 64-QAM, 40MHz	X	3.83	66.82	15.68	0.00	150.0	± 2.5 %	± 9.6 %
		Y	3.77	66.09	15.24		150.0		
		Z	3.92	66.64	15.56		150.0		

Note: For details on UID parameters see Appendix

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%.

^A The uncertainties of Norm X,Y,Z do not affect the E²-field uncertainty inside TSL (see Pages 5 and 6).^B Numerical linearization parameter: uncertainty not required.^E Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.



EX3DV4- SN:7628

February 16, 2021

DASY/EASY - Parameters of Probe: EX3DV4 - SN:7628**Sensor Model Parameters**

	C1 fF	C2 fF	α V ⁻¹	T1 ms.V ⁻²	T2 ms.V ⁻¹	T3 ms	T4 V ⁻²	T5 V ⁻¹	T6
X	8.5	59.16	31.40	4.05	0.00	4.90	0.60	0.00	1.00
Y	9.3	65.93	32.35	4.45	0.00	4.92	0.54	0.00	1.00
Z	9.2	65.89	32.86	1.60	0.00	4.90	0.18	0.00	1.00

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	-144.2
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	1.4 mm

Note: Measurement distance from surface can be increased to 3-4 mm for an *Area Scan* job.



EX3DV4- SN:7628

February 16, 2021

DASY/EASY - Parameters of Probe: EX3DV4 - SN:7628**Calibration Parameter Determined in Head Tissue Simulating Media**

f (MHz) ^C	Relative Permittivity ^F	Conductivity (S/m) ^F	ConvF X	ConvF Y	ConvF Z	Alpha ^G	Depth ^G (mm)	Unc (k=2)
750	41.9	0.89	10.48	10.48	10.48	0.43	0.80	± 12.0 %
835	41.5	0.90	10.15	10.15	10.15	0.46	0.80	± 12.0 %
900	41.5	0.97	9.77	9.77	9.77	0.51	0.86	± 12.0 %
1450	40.5	1.20	9.03	9.03	9.03	0.35	0.80	± 12.0 %
1750	40.1	1.37	8.76	8.76	8.76	0.28	0.86	± 12.0 %
1900	40.0	1.40	8.38	8.38	8.38	0.28	0.86	± 12.0 %
2000	40.0	1.40	8.29	8.29	8.29	0.37	0.88	± 12.0 %
2300	39.5	1.67	8.15	8.15	8.15	0.36	0.92	± 12.0 %
2450	39.2	1.80	8.01	8.01	8.01	0.27	0.92	± 12.0 %
2600	39.0	1.96	7.71	7.71	7.71	0.40	0.92	± 12.0 %
3300	38.2	2.71	7.24	7.24	7.24	0.30	1.35	± 13.1 %
3500	37.9	2.91	7.04	7.04	7.04	0.30	1.35	± 13.1 %
3700	37.7	3.12	7.00	7.00	7.00	0.35	1.35	± 13.1 %
3900	37.5	3.32	6.83	6.83	6.83	0.35	1.50	± 13.1 %
4100	37.2	3.53	6.73	6.73	6.73	0.35	1.50	± 13.1 %
4200	37.1	3.63	6.46	6.46	6.46	0.35	1.60	± 13.1 %
4400	36.9	3.84	6.39	6.39	6.39	0.35	1.60	± 13.1 %
4600	36.7	4.04	6.12	6.12	6.12	0.35	1.70	± 13.1 %
4800	36.4	4.25	6.16	6.16	6.16	0.40	1.80	± 13.1 %
4950	36.3	4.40	5.94	5.94	5.94	0.40	1.80	± 13.1 %
5250	35.9	4.71	5.51	5.51	5.51	0.40	1.80	± 13.1 %
5600	35.5	5.07	5.00	5.00	5.00	0.40	1.80	± 13.1 %
5750	35.4	5.22	4.95	4.95	4.95	0.40	1.80	± 13.1 %

^C Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Validity of ConvF assessed at 6 MHz is 4-9 MHz, and ConvF assessed at 13 MHz is 9-19 MHz. Above 5 GHz frequency validity can be extended to ± 110 MHz.

^F At frequencies below 3 GHz, the validity of tissue parameters (ϵ and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ϵ and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

^G Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.



EX3DV4– SN:7628

February 16, 2021

DASY/EASY - Parameters of Probe: EX3DV4 - SN:7628

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) ^C	Relative Permittivity ^F	Conductivity (S/m) ^F	ConvF X	ConvF Y	ConvF Z	Alpha ^G	Depth ^G (mm)	Unc (k=2)
6500	34.5	6.07	5.50	5.50	5.50	0.20	2.50	± 18.6 %
7000	33.9	6.65	5.60	5.60	5.60	0.25	2.50	± 18.6 %
8000	32.7	7.84	5.40	5.40	5.40	0.50	1.50	± 18.6 %
9000	31.5	9.08	5.35	5.35	5.35	0.50	1.80	± 18.6 %

^C Frequency validity above 6GHz is ± 700 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

^F At frequencies 6-10 GHz, the validity of tissue parameters (ϵ and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

^G Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz; below ± 2% for frequencies between 3-6 GHz; and below ± 4% for frequencies between 6-10 GHz at any distance larger than half the probe tip diameter from the boundary.