



SAR TEST REPORT

Applicant Huawei Technologies Co., Ltd.
FCC ID QISAMN-LX9B
Product Smart Phone
Model AMN-LX9X
Report No. R1904H0060-S1
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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.

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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

CNAS (accreditation number:L2264)

TA Technology (Shanghai) Co., Ltd. has obtained the accreditation of China National Accreditation Service for Conformity Assessment (CNAS).

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 electromagnetic emissions measurements.

IC (recognition number is 8510A)

TA Technology (Shanghai) Co., Ltd. has been listed by industry Canada to perform electromagnetic emission measurement.

VCCI (recognition number is C-4595, T-2154, R-4113, G-10766)

TA Technology (Shanghai) Co., Ltd. has been listed by industry Japan to perform electromagnetic emission measurement.

A2LA (Certificate Number: 3857.01)

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

1.3 Testing Location

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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 (Separation 15mm)	1g SAR Hotspot (Separation 10mm)
GSM 850	0.47	0.52	0.61
GSM 1900	0.33	0.22	0.22
WCDMA Band V	0.49	0.58	0.66
LTE FDD 5	0.40	0.72	0.79
LTE FDD 7	0.22	0.49	0.73
Wi-Fi (2.4G)	0.36	0.12	0.25
BT	0.38	NA	NA
Date of Testing:	April 9, 2019~ April 13, 2019		

Note: 1) The highest Reported SAR for head, body-worn, hotspot and simultaneous transmission exposure conditions are 0.49 W/kg, 0.72W/kg, 0.79W/kg and 1.04W/kg.

2) Stand-alone SAR evaluation is not required for BT (Body-worn & Hotspot), more details information see section 10.2

3) For body worn operation, this device has been tested and meets FCC RF exposure guidelines when used with any accessory that contains no metal and that positions the handset a minimum of 15mm from the body. Use of other accessories may not ensure compliance with FCC RF exposure guidelines.

The device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits according to the FCC rule § 2.1093, the ANSI C95.1: 1992/IEEE C95.1: 1991, and had been tested in accordance with the measurement methods and procedures specified in IEEE Std 1528-2013.

3 Description of Equipment under Test

Client Information

Applicant	Huawei Technologies Co., Ltd.
Applicant address	Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.China.
Manufacturer	Huawei Technologies Co., Ltd.
Manufacturer address	Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.China.

General Technologies

Application Purpose:	Original Grant
EUT Stage:	Identical Prototype
Model:	AMN-LX9X
SN:	QXPNU19330100324 (Battery 1) QXPNU19330100137 (Battery 2) QXPNU19330100026 (Battery 3)
Hardware Version:	HL1AMNMY
Software Version:	9.0.1.75(C900E31R1P2)
Antenna Type:	Internal Antenna
Device Class:	B
Wi-Fi Hotspot:	Wi-Fi 2.4G
Power Class:	GSM 850:4 GSM 1900:1 UMTS Band V:3 LTE FDD 5/7:3
Power Level:	GSM 850:level 5 GSM 1900:level 0 UMTS Band V:all up bits LTE FDD 5/7:max power
EUT Accessory	
Battery 1	Manufacturer: HuaweiTechnologies Co., Ltd. (SCUD (Fujian) Electronics Co., LTD.) Model: HB405979ECW
Battery 2	Manufacturer: HuaweiTechnologies Co., Ltd. (Desay Battery Electronic Co.,LTD) Model: HB405979ECW
Battery 3	Manufacturer: HuaweiTechnologies Co., Ltd. (Sunwoda Electronic Co.,LTD) Model: HB405979ECW



Earphone 1	Manufacturer: Jiangxi Lianchuang Hongsheng Electronic Co. ,LTD. Model: MEND1532B528A02
Earphone 2	Manufacturer: FOXCONN INTERCONNECT TECHNOLOGY LIMITED Model: EPAB542-2WH05-DH
Earphone 3	Manufacturer: Boluo County Quancheng Electronic Co.,Ltd. Model: 1293-3283-3.5MM-322

Wireless Technology and Frequency Range

Wireless Technology		Modulation	Operating mode	Tx (MHz)
GSM	850	Voice(GMSK) GPRS(GMSK)	<input type="checkbox"/> Multi-slot Class:8-1UP <input type="checkbox"/> Multi-slot Class:10-2UP	824 ~ 849
	1900	EGPRS(GMSK,8PSK)	<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 V	QPSK, 16QAM	HSDPA UE Category:14 HSUPA UE Category:7 DC-HSDPA UE Category:24 HSPA+ Category:7	824 ~ 849
LTE	FDD 5	QPSK, 16QAM	Rel.10 /Category 4	824 ~ 849
	FDD 7			2500 ~ 2570
	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
	Does this device support MIMO <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			



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:

248227 D01 802.11Wi-Fi SAR v02r02
447498 D01 General RF Exposure Guidance v06
648474 D04 Handset SAR v01r03
690783 D01 SAR Listings on Grants v01r03
865664 D01 SAR measurement 100 MHz to 6 GHz v01r04
865664 D02 RF Exposure Reporting v01r02
941225 D01 3G SAR Procedures v03r01
941225 D05 SAR for LTE Devices v02r05
941225 D05A LTE Rel.10 KDB Inquiry Sheet v01r02
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 $> 1.2 \text{ W/kg}$, 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.

5.2 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 ($\sim 10\%$ 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 2: 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 3: 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	15/15	64	12/15	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

Note1: Δ_{ACK} , Δ_{NACK} and $\Delta_{CQI} = 8 \Leftrightarrow A_{hs} = \beta_{hs}/\beta_c = 30/15 \Leftrightarrow \beta_{hs} = 30/15 * \beta_c$
Note2: CM=1 for $\beta_c/\beta_d = 12/15$, $\beta_{hs}/\beta_c = 24/15$.
Note3: For subtest 2 the $\beta_c\beta_d$ 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 4: 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: 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 $\beta_c/\beta_d = 12/15$, $\beta_{hs}/\beta_c = 24/15$. 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} can not be set directly; it is set by Absolute Grant Value.

Table 5: HSUPA UE category

UE E-DCH Category	Maximum E-DCH Codes Transmitted	Number of HARQ Processes	E-DCH TTI (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	4	8	2	2 SE2 & 2 SE4	11484	5.76



(No DPDCH)	4	4	10		20000	2.00
7	4	8	2	2 SF2 & 2 SF4	22996	?
(No DPDCH)	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, HSPA+ and DC-HSDPA Test Configuration

SAR test exclusion may apply to 3GPP Rel. 6 HSPA and Rel. 8 DC-HSDPA. When SAR measurement is required for HSPA or DC-HSDPA, 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+ and DC-HSDPA 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) SAR is required for Rel. 8 DC-HSDPA when SAR is required for Rel. 5 HSDPA; otherwise, the 3G SAR test reduction procedure is applied to DC-HSDPA with 12.2 kbps RMC as the primary mode. Power is measured for DC-HSDPA according to the H-Set 12, FRC configuration in Table C.8.1.12 of 3GPP TS 34.121-1 to determine SAR test reduction. A primary and a secondary serving HS-DSCH Cell are required to perform the power measurement and for the results to be acceptable.

4) Regardless of whether a PBA is required, the following information must be verified and included in the SAR report for devices supporting HSPA, HSPA+ or DC-HSDPA: a) The output power measurement results and applicable release version(s) of 3GPP TS 34.121.

i) 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.

5) 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 6: HS-DSCH UE category
Table 5.1a: FDD HS-DSCH physical layer categories

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			
Category 13	15	1	35280	259200	QPSK, 16QAM, 64QAM		
Category 14	15	1	42192	259200			
Category 15	15	1	23370	345600	QPSK, 16QAM		
Category 16	15	1	27952	345600			
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			
Category 21	15	1	23370	345600	-	-	QPSK, 16QAM
Category 22	15	1	27952	345600			QPSK, 16QAM, 64QAM
Category 23	15	1	35280	518400			
Category 24	15	1	42192	518400			

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 [4]. 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 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.

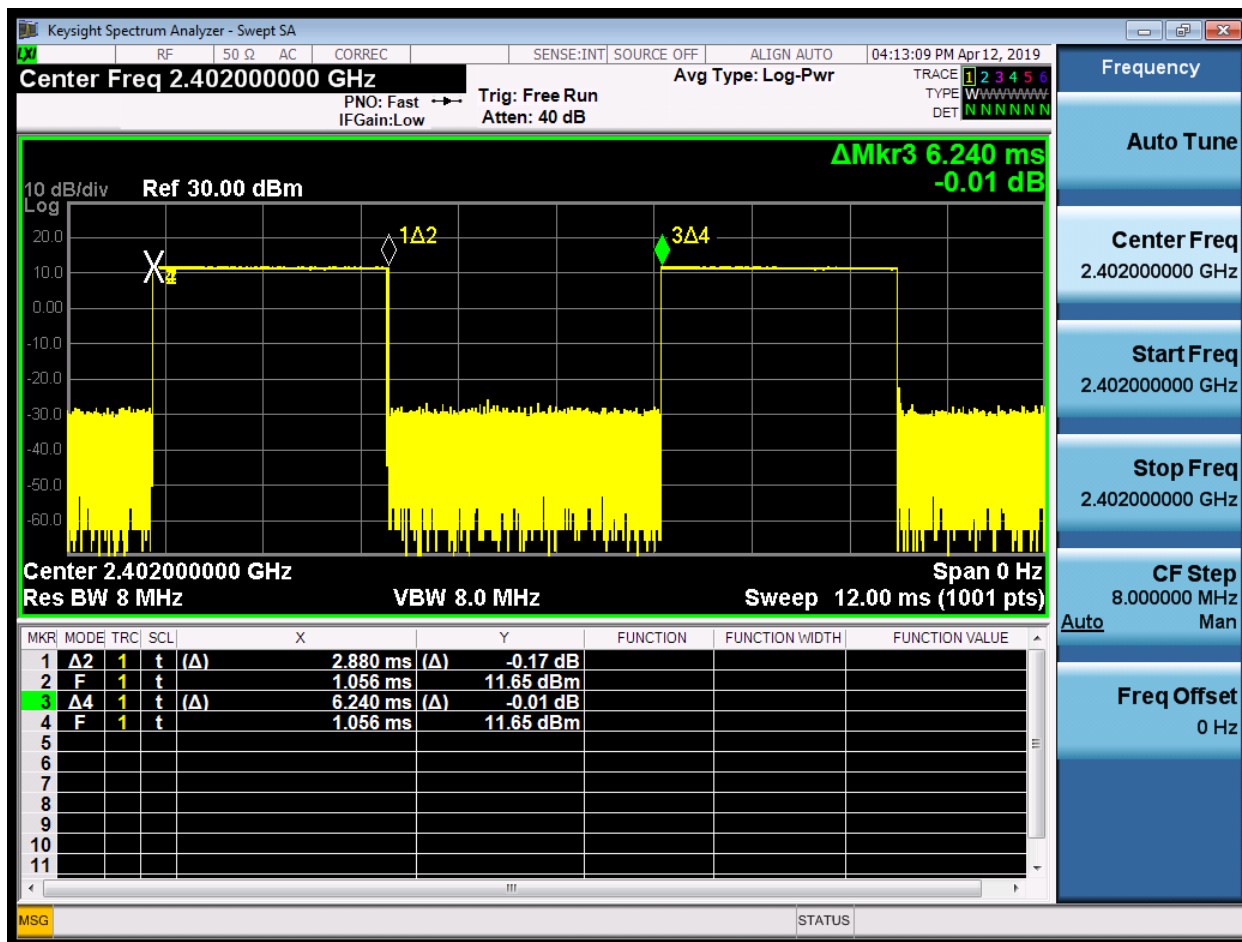
To determine the initial test position, Area Scans were performed to determine the position with the Maximum Value of SAR (measured). The position that produced the highest Maximum Value of SAR is considered the worst case position; thus used as the initial test position.

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.

5.3.5 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)=2.880/6.240=46.2%

5.3.6 Power Reduction Configuration

This device support the receiver detection mechanism, the main purpose is to minimize triggering associated with power reduction scenarios by audio receiver detection mechanisms and provide enhanced user experience. It uses the audio receiver to indicate whether the user is making a call in head scenario or not. The selection between head and body power levels is based on the audio receiver detection mechanism. It can determine proximity to head or body and set the relevant power level for 2G&3G&4G and Wi-Fi antennas accordingly.

More details information followings:

Main Antenna		Power Reduction Level Amount				
Power Reduction Scenario	Receiver	GSM850	GSM1900	UMTS5	LTE B5	LTE B7
Full power(dB)		0.00	0.00	0.00	0.00	0.00
Standalone(dB)	on	0.00	0.00	0.00	0.00	0.00
	off	0.00	0.00	0.00	0.00	1.00
Hotspot on(dB)	on	0.00	2.00	0.00	0.00	3.00
	off	0.00	2.00	0.00	0.00	3.00

Wi-Fi Antenna		Power Reduction Level Amount						
Power Reduction Scenario	Receiver	802.11b	802.11g (CH2~CH10)	802.11n HT20 (CH2~CH10)	802.11n HT40 (CH3~CH8)	802.11g (CH1&CH11)	802.11n HT20 (CH1&CH11)	802.11n HT40 (CH9)
Full power(dB)		0.00	0.00	0.00	0.00	0.00	0.00	0.00
Standalone(dB)	on	3.50	3.00	2.50	0.00	0.00	0.00	0.00
	off	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table: Summary of Receiver detection mechanism

Antenna	Audio Receiver on (headscenario)	Audio Receiver off (Body/other scenario)
2G&3G&4G Main ant	Power Level A1	Power Level B1
2.4G WIFI ant	Power Level A2	Power Level B2

Based on the summary table of Receiver detection mechanism above:

For Head SAR test,

- 1) Standalone Head SAR of 2G&3G&4G ant is evaluated at power level A1 (Receiver on) ;
- 3) Standalone Head SAR of Wi-Fi ant is evaluated at power level A2 (Receiver on) ;

For Body SAR test,

- 1) Standalone Body SAR of 2G&3G&4G second ant is evaluated at power level B1 (Receiver off) ;
- 3) Standalone Body SAR of Wi-Fi ant is evaluated at power level B2 (Receiver off) ;

5.2.3 Country code detection mechanism

The device uses the mobile country code (MCC) to indicate whether the users in CE countries or FCC countries. The selection between CE countries and FCC countries power levels is based on the country code detection mechanism. It can determine the countries where users are and set the relevant power level for Wi-Fi antennas accordingly.

Table: Summary of country code detection mechanism

Antenna	MCC OF CE COUNTRY (CE standard)	MCC OF FCC COUNTRY (FCC standard)
Wi-Fi 2.4G	Power Level A3	Power Level B3

Table: Bands supporting country code detection mechanism

Wi-Fi Antenna Power Level				
Wi-Fi 2.4G	CE		FCC	
	Mode	Power Level (dBm)	Mode	Power Level (dBm)
Rec Off	802.11b	18.00	802.11b	18.00
	802.11g	17.50	802.11g (CH2~CH10)	17.50
	802.11n HT20	17.00	802.11n HT20 (CH2~CH10)	17.00
	802.11n HT40	16.00	802.11n HT40 (CH3~CH8)	14.50
	/		802.11g (CH1&CH11)	13.50
			802.11n HT20 (CH1&CH11)	13.50
			802.11n HT40 (CH9)	11.50
Rec On	802.11b (ch1~5)	14.50	802.11b	14.50
	802.11b (ch6~8)	14.50	802.11g (CH2~CH10)	14.50
	802.11b (ch9~13)	14.50	802.11n HT20 (CH2~CH10)	14.50
	802.11g (ch1~5)	14.50	802.11n HT40 (CH3~CH8)	14.50
	/		802.11g (CH1&CH11)	13.50
			802.11n HT20 (CH1&CH11)	13.50
			802.11n HT40 (CH9)	11.50

Summary test plan:

For conducted power test, both the full power level and reduced power level will be tested by setting different MCC to validate that the country code detection mechanism works.

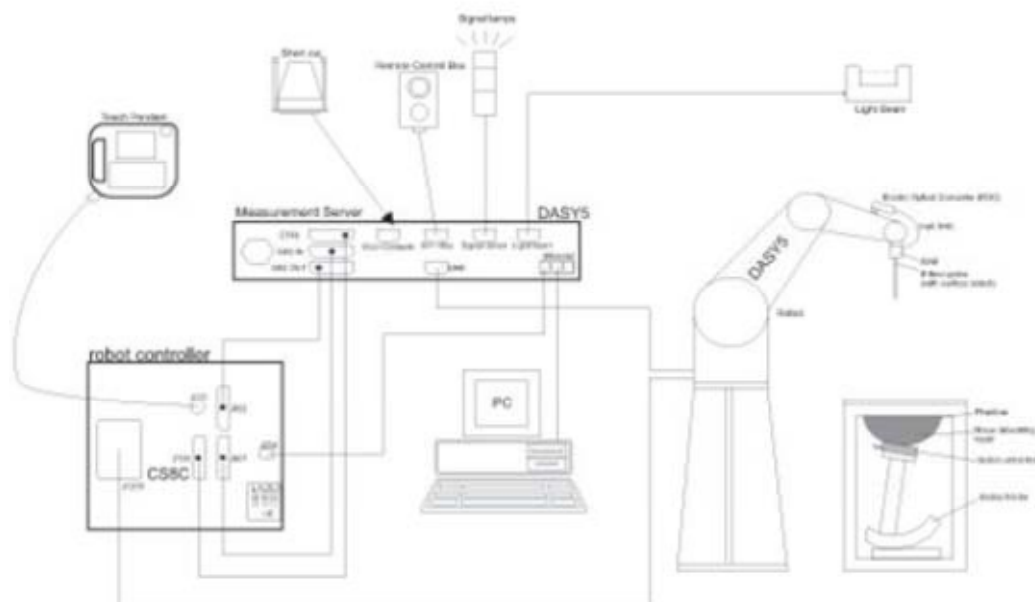
For FCC SAR test,

Standalone FCC SAR of Wi-Fi2.4G is evaluated at power level B3.

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.

$$SAR = C \Delta T / \Delta t$$

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

Or

$$SAR = IEI^2 \sigma / \rho$$

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

Zoom Scan

Zoom scans are used to 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 whose 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: $\Delta x_{\text{zoom}} \Delta y_{\text{zoom}}$			≤2GHz: ≤8mm 2 – 3GHz: ≤5mm*	3 – 4GHz: ≤5mm* 4 – 6GHz: ≤4mm*
Maximum zoom scan spatial resolution, normal to phantom surface	Uniform grid: $\Delta z_{\text{zoom}}(n)$		≤5mm	3 – 4GHz: ≤4mm 4 – 5GHz: ≤3mm 5 – 6GHz: ≤2mm
	Graded grid	$\Delta z_{\text{zoom}}(1)$: between 1 st two points closest to phantom surface	≤4mm	3 – 4GHz: ≤3mm 4 – 5GHz: ≤2.5mm 5 – 6GHz: ≤2mm
		$\Delta z_{\text{zoom}}(n>1)$: between subsequent points	≤1.5• $\Delta z_{\text{zoom}}(n-1)$	
Minimum zoom scan volume	X, y, z		≥30mm	3 – 4GHz: ≥28mm 4 – 5GHz: ≥25mm 5 – 6GHz: ≥22mm
Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.				
* When zoom scan is required and the <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.				

Volume Scan Procedures

The volume scan is used to 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	2018-05-20	2019-05-19
Dielectric Probe Kit	HP	85070E	US44020115	2018-05-20	2019-05-19
Power meter	Agilent	E4417A	GB41291714	2018-05-21	2019-05-20
Power sensor	Agilent	N8481H	MY50350004	2018-05-21	2019-05-20
Power sensor	Agilent	E9327A	US40441622	2018-05-20	2019-05-19
Dual directional coupler	Agilent	778D-012	50519	2018-05-21	2019-05-20
Dual directional coupler	Agilent	777D	50146	2018-05-20	2019-05-19
Amplifier	INDEXSAR	IXA-020	0401	2018-05-20	2019-05-19
Wideband radio communication tester	R&S	CMW 500	113645	2018-05-20	2019-05-19
BT Base Station Simulator	R&S	CBT	100271	2018-05-14	2019-05-13
E-field Probe	SPEAG	EX3DV4	3677	2018-05-29	2019-05-28
DAE	SPEAG	DAE4	1291	2018-12-04	2019-12-03
Validation Kit 835MHz	SPEAG	D835V2	4d020	2017-08-28	2020-08-27
Validation Kit 1900MHz	SPEAG	D1900V2	5d060	2017-08-26	2020-08-25
Validation Kit 2450MHz	SPEAG	D2450V2	786	2017-08-29	2020-08-28
Validation Kit 2600MHz	SPEAG	D2600V2	1025	2018-05-02	2021-05-01
Temperature Probe	Tianjin jinming	JM222	AA1009129	2018-05-17	2019-05-16
Hygrothermograph	Anymetr	NT-311	20150731	2018-05-17	2019-05-16
Software for Test	Speag	DASY5	52.8.8.1222	/	/
Softwarefor Tissue	Agilent	85070	E06.01.36	/	/

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 $\pm 2^\circ\text{C}$ 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 3 – 4 days 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)
Head	835	41.45	1.45	56	0	0.1	1.0	41.5	0.90
	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
Body	835	52.5	1.4	45	0	0.1	1.0	55.2	0.97
	1900	69.91	0.13	0	29.96	0	0	53.3	1.52
	2450	73.2	0.1	0	26.7	0	0	52.7	1.95
	2600	72.6	0.1	0	27.3	0	0	52.5	2.16

Measurements results

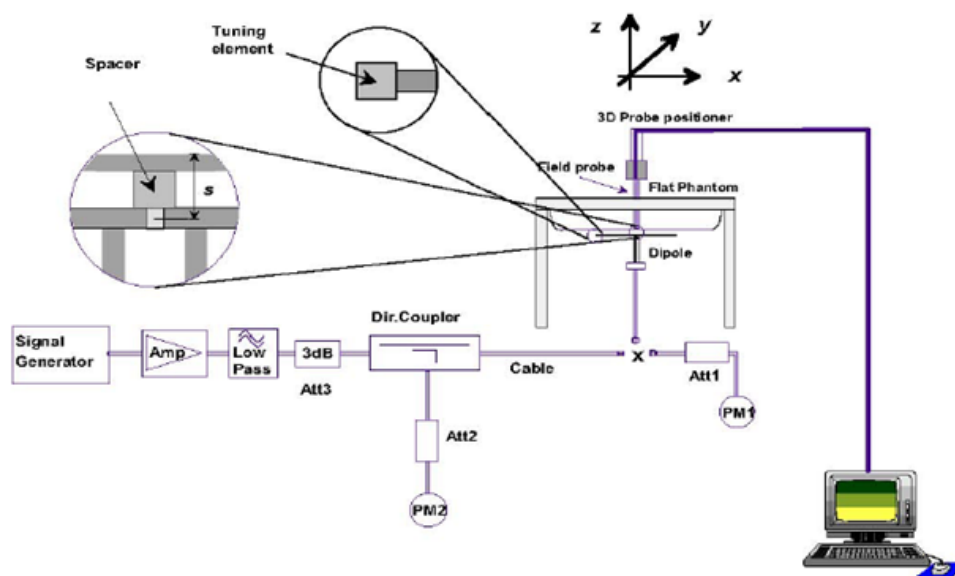
Frequency (MHz)		Test Date	Temp $^\circ\text{C}$	Measured Dielectric Parameters		Target Dielectric Parameters		Limit (Within $\pm 5\%$)	
				ϵ_r	$\sigma(\text{s/m})$	ϵ_r	$\sigma(\text{s/m})$	Dev $\epsilon_r(\%)$	Dev $\sigma(\%)$
835	Head	4/9/2019	21.5	42.0	0.91	41.5	0.90	1.20	1.11
	Body	4/11/2019	21.5	53.8	0.97	55.2	0.97	-2.54	0.00
1900	Head	4/13/2019	21.5	40.7	1.39	40.0	1.40	1.75	-0.71
	Body	4/13/2019	21.5	52.8	1.51	53.3	1.52	-0.94	-0.66
		4/13/2019	21.5	52.8	1.51	53.3	1.52	-0.94	-0.66
2450	Head	4/13/2019	21.5	38.7	1.86	39.2	1.80	-1.28	3.33
	Body	4/13/2019	21.5	51.1	1.97	52.7	1.95	-3.04	1.03
2600	Head	4/9/2019	21.5	38.1	2.02	39.0	1.96	-2.31	3.06
	Body	4/9/2019	21.5	50.7	2.16	52.5	2.16	-3.43	0.00
		4/9/2019	21.5	50.7	2.16	52.5	2.16	-3.43	0.00

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 D835V2 SN: 4d020	Head	8/28/2017	-31.9	/	50.3	/
	Liquid	8/27/2018	-29.0	9.09	46.6	-3.7
	Body	8/28/2017	-24.8	/	46.8	/
	Liquid	8/27/2018	-27.4	-10.48	48.1	1.3
Dipole D1900V2 SN: 5d060	Head	8/26/2017	-23.4	/	52.0	/
	Liquid	8/25/2018	-24.7	-5.56	54.4	2.4
	Body	8/26/2017	-21.4	/	52.7	/
	Liquid	8/25/2018	-24.6	-14.95	55.6	2.9
Dipole D2450V2 SN: 786	Head	8/29/2017	-25.5	/	53.4	/
	Liquid	8/28/2018	-23.0	9.80	57.2	3.8
	Body	8/29/2017	-23.6	/	51.0	/
	Liquid	8/28/2018	-23.7	-0.42	55.2	4.2

System Check results

Frequency (MHz)		Test Date	Temp $^{\circ}\text{C}$	250mW Measured SAR _{1g} (W/kg)	1W Normalized SAR _{1g} (W/kg)	1W Target SAR _{1g} (W/kg)	Δ % (Limit $\pm 10\%$)	Plot No.
835	Head	4/9/2019	21.5	2.44	9.76	9.45	3.28	1
	Body	4/11/2019	21.5	2.41	9.64	9.75	-1.13	2
1900	Head	4/13/2019	21.5	9.88	39.52	40.10	-1.45	3
	Body	4/13/2019	21.5	9.93	39.72	39.50	0.56	4
		4/13/2019	21.5	10.02	40.08	39.50	1.47	5
2450	Head	4/13/2019	21.5	13.70	54.80	52.60	4.18	6
	Body	4/13/2019	21.5	12.50	50.00	50.80	-1.57	7
2600	Head	4/9/2019	21.5	13.90	55.60	54.10	2.77	8
	Body	4/9/2019	21.5	13.50	54.00	54.50	-0.92	9
		4/9/2019	21.5	13.67	54.68	54.50	0.33	10

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

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 850		Burst-Averaged output power(dBm)				Division Factors	Frame-Averaged output power(dBm)			
		Tune-up	Channel/Frenqucy(MHz)				Tune-up	Channel/Frenqucy(MHz)		
		MAX	128 /824.2	190 /836.6	251 /848.8		MAX	128 /824.2	190 /836.6	251 /848.8
GSM	CS	34.00	33.01	32.94	32.97	9.03	24.97	23.98	23.91	23.94
GPRS/EGPRS (GMSK)	1 Tx Slot	34.00	33.00	32.93	32.95	9.03	24.97	23.97	23.90	23.92
	2 Tx Slots	31.00	30.02	29.98	30.04	6.02	24.98	24.00	23.96	24.02
	3 Tx Slots	29.20	28.20	28.18	28.27	4.26	24.94	23.94	23.92	24.01
	4 Tx Slots	28.00	26.83	26.85	26.97	3.01	24.99	23.82	23.84	23.96
EGPRS (8PSK)	1 Tx Slot	28.00	27.02	27.04	26.93	9.03	18.97	17.99	18.01	17.90
	2 Tx Slots	25.00	24.10	24.15	24.38	6.02	18.98	18.08	18.13	18.36
	3 Tx Slots	23.20	22.85	22.61	22.52	4.26	18.94	18.59	18.35	18.26
	4 Tx Slots	22.00	21.61	21.31	21.17	3.01	18.99	18.60	18.30	18.16
GSM 1900 (Full Power)		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	31.00	30.40	30.22	30.27	9.03	21.97	21.37	21.19	21.24
GPRS/EGPRS (GMSK)	1 Tx Slot	31.00	30.21	30.07	30.28	9.03	21.97	21.18	21.04	21.25
	2 Tx Slots	28.00	27.31	27.18	27.38	6.02	21.98	21.29	21.16	21.36
	3 Tx Slots	26.20	25.56	25.42	25.68	4.26	21.94	21.30	21.16	21.42
	4 Tx Slots	25.00	24.28	24.17	24.38	3.01	21.99	21.27	21.16	21.37
EGPRS (8PSK)	1 Tx Slot	27.00	26.54	26.52	26.50	9.03	17.97	17.51	17.49	17.47
	2 Tx Slots	24.00	23.78	23.75	23.51	6.02	17.98	17.76	17.73	17.49
	3 Tx Slots	22.20	21.78	21.98	21.73	4.26	17.94	17.52	17.72	17.47
	4 Tx Slots	21.00	20.56	20.62	19.92	3.01	17.99	17.55	17.61	16.91
GSM 1900 (Receiver off+ hotspot on)		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	29.00	28.24	28.10	28.29	9.03	19.97	19.21	19.07	19.26
GPRS/EGPRS	1 Tx Slot	29.00	28.23	28.08	28.28	9.03	19.97	19.20	19.05	19.25
	2 Tx Slots	26.00	25.31	25.16	25.44	6.02	19.98	19.29	19.14	19.42



(GMSK)	3 Tx Slots	24.20	23.59	23.47	23.69	4.26	19.94	19.33	19.21	19.43
	4 Tx Slots	23.00	22.34	22.21	22.42	3.01	19.99	19.33	19.20	19.41
EGPRS (8PSK)	1 Tx Slot	27.00	26.51	26.60	26.47	9.03	17.97	17.48	17.57	17.44
	2 Tx Slots	24.00	23.60	23.67	23.52	6.02	17.98	17.58	17.65	17.50
	3 Tx Slots	22.20	21.83	22.82	21.68	4.26	17.94	17.57	18.56	17.42
	4 Tx Slots	21.00	20.43	20.44	20.21	3.01	17.99	17.42	17.43	17.20

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

1. Standalone: GSM 850 GMSK (GPRS) mode with 4 time slots for Max power, GSM 1900 GMSK (GPRS) mode with 4 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 V(dBm)			
Tx Channel		4132	4183	4233	Tune-up Limit
Frequency(MHz)		826.4	836.6	846.6	
RMC	12.2kbps	24.02	24.01	24.12	25.00
AMR	12.2kbps	23.92	23.92	23.99	25.00
HSDPA	Sub 1	23.44	23.43	23.54	24.50
	Sub 2	23.43	23.42	23.53	24.50
	Sub 3	22.92	22.91	23.02	24.00
	Sub 4	22.91	22.90	23.01	24.00
HSUPA	Sub 1	22.76	22.82	22.89	23.00
	Sub 2	22.39	22.38	22.49	23.00
	Sub 3	22.87	22.87	22.98	24.00
	Sub 4	22.36	22.36	22.47	22.50
	Sub 5	23.35	23.35	23.46	24.00
DC-HSDPA	Sub 1	23.16	23.17	23.26	24.50
	Sub 2	23.15	23.16	23.25	24.50
	Sub 3	22.73	22.65	22.76	24.00
	Sub 4	22.72	22.64	22.75	24.00
HSPA+	16QAM	22.56	22.68	22.74	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

LTE FDD Band 5				Conducted Power(dBm)			Tune-up Limit
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			
				20407/824.7	20525/836.5	20643/848.3	
1.4MHz	QPSK	1	0	23.52	23.60	23.55	25.00
		1	2	23.79	23.86	23.70	25.00
		1	5	23.63	23.60	23.48	25.00
		3	0	23.52	23.65	23.59	25.00
		3	2	23.61	23.75	23.59	25.00
		3	3	23.64	23.70	23.44	25.00
		6	0	22.57	22.80	22.66	24.00
	16QAM	1	0	23.09	23.15	23.05	24.00
		1	2	23.07	23.20	23.07	24.00
		1	5	23.14	22.96	23.01	24.00
		3	0	22.49	22.62	22.55	24.00
		3	2	22.74	22.59	22.60	24.00
		3	3	22.50	22.64	22.50	24.00
		6	0	21.51	21.70	21.65	23.00
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit
				20415/825.5	20525/836.5	20635/847.5	
3MHz	QPSK	1	0	23.54	23.64	23.58	25.00
		1	7	23.77	23.89	23.74	25.00
		1	14	23.66	23.65	23.52	25.00
		8	0	22.62	22.77	22.72	24.00
		8	4	22.73	22.85	22.71	24.00
		8	7	22.74	22.81	22.54	24.00
		15	0	22.57	22.84	22.69	24.00
	16QAM	1	0	23.12	23.17	23.08	24.00
		1	7	23.10	23.20	23.11	24.00
		1	14	23.16	23.00	23.04	24.00
		8	0	21.60	21.75	21.67	23.00



		8	4	21.85	21.72	21.72	23.00
		8	7	21.60	21.76	21.63	23.00
		15	0	21.54	21.74	21.68	23.00
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit
				20425/826.5	20525/836.5	20625/846.5	
5MHz	QPSK	1	0	23.51	23.62	23.54	25.00
		1	13	23.75	23.85	23.71	25.00
		1	24	23.63	23.60	23.48	25.00
		12	0	22.59	22.72	22.68	24.00
		12	6	22.71	22.81	22.66	24.00
		12	13	22.72	22.79	22.50	24.00
		25	0	22.57	22.83	22.67	24.00
	16QAM	1	0	23.09	23.13	23.05	24.00
		1	13	23.07	23.18	23.08	24.00
		1	24	23.13	22.98	23.00	24.00
		12	0	21.58	21.71	21.64	23.00
		12	6	21.82	21.67	21.68	23.00
		12	13	21.57	21.71	21.59	23.00
		25	0	21.52	21.70	21.63	23.00
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit
				20450/829	20525/836.5	20600/844	
10MHz	QPSK	1	0	23.49	23.55	23.52	25.00
		1	25	23.75	23.85	23.70	25.00
		1	49	23.60	23.58	23.44	25.00
		25	0	22.57	22.68	22.65	24.00
		25	13	22.69	22.77	22.63	24.00
		25	25	22.68	22.75	22.47	24.00
		50	0	22.56	22.76	22.62	24.00
	16QAM	1	0	22.86	23.10	23.00	24.00
		1	25	23.04	23.17	23.05	24.00
		1	49	23.11	22.93	22.98	24.00
		25	0	21.55	21.70	21.62	23.00
		25	13	21.78	21.64	21.64	23.00
		25	25	21.55	21.67	21.56	23.00
		50	0	21.50	21.66	21.60	23.00

LTE FDD Band 7 (Receiver on)				Conducted Power(dBm)			Tune-up Limit
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			
				20775/2502.5	21100/2535	21425/2567.5	
5MHz	QPSK	1	0	21.31	21.25	21.27	23.00
		1	13	21.67	21.71	21.70	23.00
		1	24	21.30	21.39	21.28	23.00



		12	0	20.59	20.57	20.54	22.00
		12	6	20.65	20.64	20.61	22.00
		12	13	20.65	20.63	20.49	22.00
		25	0	20.67	20.63	20.58	22.00
	16QAM	1	0	20.93	20.71	20.76	22.00
		1	13	20.91	20.77	20.85	22.00
		1	24	20.71	20.84	20.68	22.00
		12	0	19.61	19.53	19.56	21.00
		12	6	19.66	19.58	19.63	21.00
		12	13	19.62	19.63	19.50	21.00
		25	0	19.59	19.57	19.51	21.00
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit
				20800/2505	21100/2535	21400/2565	
10MHz	QPSK	1	0	21.33	21.26	21.30	23.00
		1	25	21.70	21.76	21.74	23.00
		1	49	21.32	21.43	21.31	23.00
		25	0	20.62	20.62	20.58	22.00
		25	13	20.68	20.69	20.65	22.00
		25	25	20.67	20.67	20.54	22.00
		50	0	20.71	20.65	20.62	22.00
	16QAM	1	0	20.95	20.74	20.78	22.00
		1	25	20.94	20.81	20.88	22.00
		1	49	20.74	20.86	20.71	22.00
		25	0	19.64	19.58	19.60	21.00
		25	13	19.68	19.62	19.66	21.00
		25	25	19.65	19.68	19.54	21.00
		50	0	19.62	19.62	19.55	21.00
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit
				20825/2507.5	21100/2535	21375/2562.5	
15MHz	QPSK	1	0	21.32	21.22	21.28	23.00
		1	38	21.68	21.75	21.71	23.00
		1	74	21.29	21.38	21.27	23.00
		36	0	20.60	20.58	20.55	22.00
		36	18	20.65	20.64	20.61	22.00
		36	39	20.64	20.64	20.50	22.00
		75	0	20.69	20.61	20.57	22.00
	16QAM	1	0	20.90	20.72	20.76	22.00
		1	38	20.92	20.78	20.86	22.00
		1	74	20.71	20.82	20.68	22.00
		36	0	19.61	19.56	19.57	21.00
		36	18	19.65	19.57	19.62	21.00
		36	39	19.63	19.64	19.51	21.00
		75	0	19.59	19.57	19.51	21.00



Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit
				20850/2510	21100/2535	21350/2560	
20MHz	QPSK	1	0	21.29	21.18	21.25	23.00
		1	50	21.67	21.71	21.69	23.00
		1	99	21.27	21.37	21.24	23.00
		50	0	20.57	20.53	20.51	22.00
		50	25	20.63	20.60	20.58	22.00
		50	50	20.61	20.59	20.46	22.00
		100	0	20.66	20.56	20.53	22.00
	16QAM	1	0	20.69	20.68	20.71	22.00
		1	50	20.88	20.76	20.82	22.00
		1	99	20.69	20.79	20.66	22.00
		50	0	19.58	19.52	19.54	21.00
		50	25	19.62	19.55	19.59	21.00
		50	50	19.60	19.59	19.47	21.00
		100	0	19.57	19.53	19.48	21.00

LTE FDD Band 7 (Receiver off)				Conducted Power(dBm)			Tune-up Limit
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			
				20775/2502.5	21100/2535	21425/2567.5	
5MHz	QPSK	1	0	20.50	20.33	20.39	22.00
		1	13	20.83	20.75	20.81	22.00
		1	24	20.43	20.41	20.40	22.00
		12	0	20.70	20.52	20.68	22.00
		12	6	20.73	20.70	20.72	22.00
		12	13	20.73	20.66	20.67	22.00
		25	0	20.71	20.68	20.72	22.00
	16QAM	1	0	21.15	20.71	20.85	22.00
		1	13	21.13	21.07	21.19	22.00
		1	24	20.82	21.01	20.84	22.00
		12	0	19.66	19.60	19.67	21.00
		12	6	19.73	19.69	19.72	21.00
		12	13	19.73	19.71	19.69	21.00
		25	0	19.68	19.62	19.67	21.00
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit
				20800/2505	21100/2535	21400/2565	
10MHz	QPSK	1	0	20.52	20.34	20.42	22.00
		1	25	20.86	20.80	20.85	22.00
		1	49	20.45	20.45	20.43	22.00
		25	0	20.73	20.57	20.72	22.00
		25	13	20.76	20.75	20.76	22.00
		25	25	20.75	20.70	20.72	22.00



	16QAM	50	0	20.75	20.70	20.76	22.00
		1	0	21.17	20.74	20.87	22.00
		1	25	21.16	21.11	21.22	22.00
		1	49	20.85	21.03	20.87	22.00
		25	0	19.69	19.65	19.71	21.00
		25	13	19.75	19.73	19.75	21.00
		25	25	19.76	19.76	19.73	21.00
		50	0	19.71	19.67	19.71	21.00
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit
				20825/2507.5	21100/2535	21375/2562.5	
15MHz	QPSK	1	0	20.51	20.30	20.40	22.00
		1	38	20.84	20.79	20.82	22.00
		1	74	20.42	20.40	20.39	22.00
		36	0	20.71	20.53	20.69	22.00
		36	18	20.73	20.70	20.72	22.00
		36	39	20.72	20.67	20.68	22.00
		75	0	20.73	20.66	20.71	22.00
	16QAM	1	0	21.12	20.72	20.85	22.00
		1	38	21.14	21.08	21.20	22.00
		1	74	20.82	20.99	20.84	22.00
		36	0	19.66	19.63	19.68	21.00
		36	18	19.72	19.68	19.71	21.00
		36	39	19.74	19.72	19.70	21.00
		75	0	19.68	19.62	19.67	21.00
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit
				20850/2510	21100/2535	21350/2560	
20MHz	QPSK	1	0	20.48	20.26	20.37	22.00
		1	50	20.83	20.75	20.80	22.00
		1	99	20.40	20.39	20.36	22.00
		50	0	20.68	20.48	20.65	22.00
		50	25	20.71	20.66	20.69	22.00
		50	50	20.69	20.62	20.64	22.00
		100	0	20.70	20.61	20.67	22.00
	16QAM	1	0	20.86	20.68	20.80	22.00
		1	50	21.10	21.06	21.16	22.00
		1	99	20.80	20.96	20.82	22.00
		50	0	19.63	19.59	19.65	21.00
		50	25	19.69	19.66	19.68	21.00
		50	50	19.71	19.67	19.66	21.00
		100	0	19.66	19.58	19.64	21.00

LTE FDD Band 7 (Receiver off+hotspot on)	Conducted Power(dBm)	Tune-up Limit
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Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			
				20775/2502.5	21100/2535	21425/2567.5	
5MHz	QPSK	1	0	18.38	18.33	18.40	20.00
		1	13	18.63	18.71	18.76	20.00
		1	24	18.36	18.43	18.35	20.00
		12	0	18.62	18.60	18.66	20.00
		12	6	18.66	18.72	18.67	20.00
		12	13	18.66	18.75	18.62	20.00
		25	0	18.64	18.72	18.66	20.00
	16QAM	1	0	19.21	18.63	18.84	20.00
		1	13	19.19	19.19	19.23	20.00
		1	24	18.79	19.03	18.80	20.00
		12	0	18.67	18.60	18.66	20.00
		12	6	18.71	18.75	18.69	20.00
		12	13	18.66	18.74	18.64	20.00
		25	0	18.64	18.62	18.67	20.00
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit
				20800/2505	21100/2535	21400/2565	
10MHz	QPSK	1	0	18.40	18.34	18.43	20.00
		1	25	18.66	18.76	18.80	20.00
		1	49	18.38	18.47	18.38	20.00
		25	0	18.65	18.65	18.70	20.00
		25	13	18.69	18.77	18.71	20.00
		25	25	18.68	18.79	18.67	20.00
		50	0	18.68	18.74	18.70	20.00
	16QAM	1	0	19.23	18.66	18.86	20.00
		1	25	19.22	19.23	19.26	20.00
		1	49	18.82	19.05	18.83	20.00
		25	0	18.70	18.65	18.70	20.00
		25	13	18.73	18.79	18.72	20.00
		25	25	18.69	18.79	18.68	20.00
		50	0	18.67	18.67	18.71	20.00
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit
				20825/2507.5	21100/2535	21375/2562.5	
15MHz	QPSK	1	0	18.39	18.30	18.41	20.00
		1	38	18.64	18.75	18.77	20.00
		1	74	18.35	18.42	18.34	20.00
		36	0	18.63	18.61	18.67	20.00
		36	18	18.66	18.72	18.67	20.00
		36	39	18.65	18.76	18.63	20.00
		75	0	18.66	18.70	18.65	20.00
	16QAM	1	0	19.18	18.64	18.84	20.00
		1	38	19.20	19.20	19.24	20.00



		1	74	18.79	19.01	18.80	20.00
		36	0	18.67	18.63	18.67	20.00
		36	18	18.70	18.74	18.68	20.00
		36	39	18.67	18.75	18.65	20.00
		75	0	18.64	18.62	18.67	20.00
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit
				20850/2510	21100/2535	21350/2560	
20MHz	QPSK	1	0	18.36	18.26	18.38	20.00
		1	50	18.63	18.71	18.75	20.00
		1	99	18.33	18.41	18.31	20.00
		50	0	18.60	18.56	18.63	20.00
		50	25	18.64	18.68	18.64	20.00
		50	50	18.62	18.71	18.59	20.00
		100	0	18.63	18.65	18.61	20.00
	16QAM	1	0	18.84	18.60	18.79	20.00
		1	50	19.16	19.18	19.20	20.00
		1	99	18.77	18.98	18.78	20.00
		50	0	18.64	18.59	18.64	20.00
		50	25	18.67	18.72	18.65	20.00
		50	50	18.64	18.70	18.61	20.00
		100	0	18.62	18.58	18.64	20.00

9.4 WLAN Mode

FCC

Wi-Fi 2.4G Full Power Mode	Channel /Frequency(MHz)	Maximum Output Power (dBm)	
		Tune-up	Meas.
802.11b (1M)	1/2412	18.00	17.14
	6/2437	18.00	17.01
	11/2462	18.00	17.03
802.11g (6M)	1/2412	13.50	11.98
	2/2417	17.50	15.97
	6/2437	17.50	15.67
	10/2457	17.50	15.95
	11/2462	13.50	11.98
802.11n-HT20 (MCS0)	1/2412	13.50	11.84
	2/2417	17.00	15.33
	6/2437	17.00	15.39
	10/2457	17.00	15.36
	11/2462	13.50	11.82
802.11n-HT40 (MCS0)	3/2422	14.50	12.72
	6/2437	14.50	12.71
	8/2447	14.50	12.69
	9/2452	11.50	9.82

Wi-Fi 2.4G Receiver on Mode	Channel /Frequency(MHz)	Maximum Output Power (dBm)	
		Tune-up	Meas.
802.11b (1M)	1/2412	14.50	13.73
	6/2437	14.50	13.70
	11/2462	14.50	13.72
802.11g (6M)	1/2412	13.50	11.94
	2/2417	14.50	12.99
	6/2437	14.50	13.03
	10/2457	14.50	13.07
	11/2462	13.50	11.96
802.11n-HT20 (MCS0)	1/2412	13.50	11.77
	2/2417	14.50	12.98
	6/2437	14.50	13.02
	10/2457	14.50	12.88



	11/2462	13.50	11.74
802.11n-HT40 (MCS0)	3/2422	14.50	12.70
	6/2437	14.50	12.69
	8/2447	14.50	12.64
	9/2452	11.50	9.79

CE

Wi-Fi 2.4GHz (Full Power)	Channel /Frequency(MHz)	Average Conducted Power (dBm)	
		Tune-up	Meas.
802.11b (1M)	1/2412	18.00	17.23
	7/2442	18.00	17.14
	13/2472	18.00	17.25
802.11g (6M)	1/2412	17.50	15.77
	7/2442	17.50	15.95
	13/2472	17.50	15.76
802.11n-HT20 (MCS0)	1/2412	17.00	15.26
	7/2442	17.00	15.48
	13/2472	17.00	15.27
802.11n-HT40 (MCS0)	3/2422	16.00	14.30
	7/2442	16.00	14.21
	11/2462	16.00	13.97

Wi-Fi 2.4GHz (Receiver on)	Channel /Frequency(MHz)	Average Conducted Power (dBm)	
		Tune-up	Meas.
802.11b (1M)	1/2412	14.50	14.20
	7/2442	14.50	14.27
	13/2472	14.50	14.39
802.11g (6M)	1/2412	14.50	13.85
	7/2442	14.50	13.93
	13/2472	14.50	13.99
802.11n-HT20 (MCS0)	1/2412	14.50	13.78
	7/2442	14.50	13.90
	13/2472	14.50	13.94
802.11n-HT40 (MCS0)	3/2422	14.50	13.62
	7/2442	14.50	13.73
	11/2462	14.50	13.54

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	9.99	9.20	9.64	12.00
$\pi/4$ DQPSK	9.34	8.30	8.99	10.00
8DPSK	9.80	8.76	9.51	10.00
BLE	Ch 0/2402 MHz	Ch 19/2440 MHz	Ch 39/2480 MHz	Tune-up Limit (dBm)
GFSK	-2.00	-1.48	-1.79	0.00
BT5.0	-1.93	-1.51	-1.92	0.00

10 Measured and Reported (Scaled) SAR Results

10.1 EUT Antenna Locations

The Detailed Antenna Locations refer to *Antenna Locations*.

Overall (Length x Width): 147.13mm x 70.78 mm						
Overall Diagonal: 155mm/Display Diagonal: 141mm						
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	>25 mm	<25mm
BT/Wi-Fi Antenna	<25mm	<25mm	>25 mm	<25mm	<25mm	>25 mm
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. 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) $\leq 0.8 \text{ W/kg}$ or 2.0 W/kg , for 1-g or 10-g respectively, when the transmission band is $\leq 100\text{MHz}$

b) $\leq 0.6 \text{ W/kg}$ or 1.5 W/kg , for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz.

c) $\leq 0.4 \text{ W/kg}$ or 1.0 W/kg , for 1-g or 10-g respectively, when the transmission band is $\geq 200 \text{ MHz}$.

3. When the original highest measured SAR is $\geq 0.80 \text{ W/kg}$, the measurement was repeated once.

4. Per FCC KDB Publication 648474 D04, SAR was evaluated without a headset connected to the device. Since the reported SAR was $\leq 1.2 \text{ W/kg}$, no additional SAR evaluations using a headset cable were required.

10.2 Standalone SAR test exclusion considerations

Per KDB 447498 D01, the 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:

$[(\text{max. power of channel, including tune-up tolerance, mW})/(\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}] \leq 3.0$ for 1-g SAR and ≤ 7.5 for product specific 10-g SAR

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

Per KDB 447498 D01, when the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

Bluetooth	Distance (mm)	MAXPower (dBm)	Frequency (MHz)	Ratio	Evaluation
Head	5	12	2480	4.99	Yes
Body-worn	15	12	2480	1.66	No
Hotspot SAR	10	12	2480	2.50	No



10.3 Measured SAR Results

Table 7: GSM 850

Test Position	Cover Type	Time slot	Duty Cycle	Channel/ Frequency (MHz)	Tune-up (dBm)	Measured power (dBm)	Limit of SAR 1.6 W/kg (mW/g)				Plot No.
							Measured SAR1g	Power Drift (dB)	Scaling Factor	Report SAR1g	
Head SAR											
Left Cheek	standard	GSM	1:8.3	190/836.6	34.00	32.94	0.369	0.040	1.28	0.471	11
Left Tilt	standard	GSM	1:8.3	190/836.6	34.00	32.94	0.259	0.020	1.28	0.331	/
Right Cheek	standard	GSM	1:8.3	190/836.6	34.00	32.94	0.358	0.090	1.28	0.457	/
Right Tilt	standard	GSM	1:8.3	190/836.6	34.00	32.94	0.208	0.027	1.28	0.265	/
Body-worn SAR (Distance 15mm)											
Back Side	standard	GSM	1:8.3	190/836.6	34.00	32.94	0.404	0.070	1.28	0.516	12
Front Side	standard	GSM	1:8.3	190/836.6	34.00	32.94	0.379	0.010	1.28	0.484	/
Hotspot SAR(Distance 10mm)											
Back Side	standard	4Txslots	1:2.07	190/836.6	28.00	26.85	0.470	0.010	1.30	0.612	13
Front Side	standard	4Txslots	1:2.07	190/836.6	28.00	26.85	0.263	-0.020	1.30	0.343	/
Left Edge	standard	4Txslots	1:2.07	190/836.6	28.00	26.85	0.223	-0.030	1.30	0.291	/
Right Edge	standard	4Txslots	1:2.07	190/836.6	28.00	26.85	0.233	-0.060	1.30	0.304	/
Top Edge	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Bottom Edge	standard	4Txslots	1:2.07	190/836.6	28.00	26.85	0.034	-0.090	1.30	0.044	/
Note: 1.The value with blue color is the maximum SAR Value of each test band.											
2.When multiple slots are used, SAR should be tested to account for the maximum source-based time-averaged output power.											



Table 8: GSM 1900

Test Position	Cover Type	Time slot	Duty Cycle	Channel/ Frequency (MHz)	Tune-up (dBm)	Measured power (dBm)	Limit of SAR 1.6 W/kg (mW/g)				Plot No.
							Measured SAR1g	Power Drift (dB)	Scaling Factor	Report SAR1g	
Head SAR (Full Power)											
Left Cheek	standard	GSM	1:8.3	661/1880	31.00	30.22	0.273	0.031	1.20	0.327	14
Left Tilt	standard	GSM	1:8.3	661/1880	31.00	30.22	0.119	0.060	1.20	0.142	/
Right Cheek	standard	GSM	1:8.3	661/1880	31.00	30.22	0.174	0.140	1.20	0.208	/
Right Tilt	standard	GSM	1:8.3	661/1880	31.00	30.22	0.114	0.036	1.20	0.136	/
Body-worn SAR (Distance 15mm) (Full Power)											
Back Side	standard	GSM	1:8.3	661/1880	31.00	30.22	0.183	0.160	1.20	0.219	15
Front Side	standard	GSM	1:8.3	661/1880	31.00	30.22	0.176	0.060	1.20	0.211	/
Hotspot SAR (Distance 10mm) (Receiver off+Hotspot on)											
Back Side	standard	4Txslots	1:2.07	661/1880	23.00	22.21	0.164	-0.150	1.20	0.197	/
Front Side	standard	4Txslots	1:2.07	661/1880	23.00	22.21	0.159	0.070	1.20	0.191	/
Left Edge	standard	4Txslots	1:2.07	661/1880	23.00	22.21	0.182	0.140	1.20	0.218	16
Right Edge	standard	4Txslots	1:2.07	661/1880	23.00	22.21	0.061	0.021	1.20	0.073	/
Top Edge	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Bottom Edge	standard	4Txslots	1:2.07	661/1880	23.00	22.21	0.120	0.060	1.20	0.144	/
Note: 1.The value with blue color is the maximum SAR Value of each test band.											
2.When multiple slots are used, SAR should be tested to account for the maximum source-based time-averaged output power.											



Table 9: UMTS Band V

Test Position	Cover Type	Channel Type	Duty Cycle	Channel/ Frequency (MHz)	Tune-up (dBm)	Measured power (dBm)	Limit of SAR 1.6 W/kg (mW/g)				Plot No.
							Measured SAR1g	Power Drift (dB)	Scaling Factor	Report SAR1g	
Head SAR											
Left Cheek	standard	RMC 12.2K	1:1	4183/836.6	25.00	24.01	0.387	0.100	1.26	0.486	17
Left Tilt	standard	RMC 12.2K	1:1	4183/836.6	25.00	24.01	0.217	-0.070	1.26	0.273	/
Right Cheek	standard	RMC 12.2K	1:1	4183/836.6	25.00	24.01	0.364	-0.140	1.26	0.457	/
Right Tilt	standard	RMC 12.2K	1:1	4183/836.6	25.00	24.01	0.247	0.180	1.26	0.310	/
Left Cheek	SIM2	RMC 12.2K	1:1	4183/836.6	25.00	24.01	0.363	0.060	1.26	0.456	/
Left Cheek	Battery2	RMC 12.2K	1:1	4183/836.6	25.00	24.01	0.318	0.040	1.26	0.399	/
Left Cheek	Battery3	RMC 12.2K	1:1	4183/836.6	25.00	24.01	0.323	0.120	1.26	0.406	/
Body-worn SAR (Distance 15mm)											
Back Side	standard	RMC 12.2K	1:1	4183/836.6	25.00	24.01	0.459	-0.048	1.26	0.577	18
Front Side	standard	RMC 12.2K	1:1	4183/836.6	25.00	24.01	0.339	0.000	1.26	0.426	/
Hotspot SAR(Distance 10mm)											
Back Side	standard	RMC 12.2K	1:1	4183/836.6	25.00	24.01	0.526	0.000	1.26	0.661	19
Front Side	standard	RMC 12.2K	1:1	4183/836.6	25.00	24.01	0.340	-0.020	1.26	0.427	/
Left Edge	standard	RMC 12.2K	1:1	4183/836.6	25.00	24.01	0.339	-0.050	1.26	0.426	/
Right Edge	standard	RMC 12.2K	1:1	4183/836.6	25.00	24.01	0.328	-0.030	1.26	0.412	/
Top Edge	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Bottom Edge	standard	RMC 12.2K	1:1	4183/836.6	25.00	24.01	0.041	-0.110	1.26	0.052	/

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

2. 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.

3. Accessories that do not contain RF transmitters and have been proven to increase the peak SAR by less than 5 %, such as hands-free kits, do not need SAR tests separate from the SAR tests attached to a main EUT configuration.



Table 10: LTE Band 5

Test Position	Cover Type	Duty Cycle	RB allocation	RB offset	Channel/ Frequency (MHz)	Tune-up (dBm)	Measured power (dBm)	Limit of SAR 1.6 W/kg (mW/g)				Plot No.
								Measured SAR1g	Power Drift (dB)	Scaling Factor	Report SAR1g	
Head SAR (QPSK)												
Left Cheek	standard	1:1	1	25	20525/836.5	25.00	23.85	0.278	0.065	1.30	0.362	/
Left Tilt	standard	1:1	1	25	20525/836.5	25.00	23.85	0.161	0.150	1.30	0.210	/
Right Cheek	standard	1:1	1	25	20525/836.5	25.00	23.85	0.304	0.030	1.30	0.396	20
Right Tilt	standard	1:1	1	25	20525/836.5	25.00	23.85	0.192	0.090	1.30	0.250	/
Left Cheek	standard	1:1	50%	13	20525/836.5	24.00	22.77	0.258	0.020	1.33	0.342	/
Left Tilt	standard	1:1	50%	13	20525/836.5	24.00	22.77	0.171	0.070	1.33	0.227	/
Right Cheek	standard	1:1	50%	13	20525/836.5	24.00	22.77	0.244	0.022	1.33	0.324	/
Right Tilt	standard	1:1	50%	13	20525/836.5	24.00	22.77	0.153	0.140	1.33	0.203	/
Body-worn SAR (QPSK, Distance 15mm)												
Back Side	standard	1:1	1	25	20525/836.5	25.00	23.85	0.490	-0.010	1.30	0.639	/
Front Side	standard	1:1	1	25	20525/836.5	25.00	23.85	0.336	-0.080	1.30	0.438	/
Back Side	standard	1:1	50%	13	20525/836.5	24.00	22.77	0.391	-0.010	1.33	0.519	/
Front Side	standard	1:1	50%	13	20525/836.5	24.00	22.77	0.268	0.030	1.33	0.356	/
Back Side	SIM2	1:1	1	25	20525/836.5	25.00	23.85	0.528	-0.070	1.30	0.688	/
Back Side	Battery2	1:1	1	25	20525/836.5	25.00	23.85	0.550	-0.060	1.30	0.717	21
Back Side	Battery3	1:1	1	25	20525/836.5	25.00	23.85	0.530	-0.040	1.30	0.691	/
Hotspot SAR(QPSK, Distance 10mm)												
Back Side	standard	1:1	1	25	20525/836.5	25.00	23.85	0.591	0.000	1.30	0.770	/
Front Side	standard	1:1	1	25	20525/836.5	25.00	23.85	0.334	-0.070	1.30	0.435	/
Left Edge	standard	1:1	1	25	20525/836.5	25.00	23.85	0.279	-0.049	1.30	0.364	/
Right Edge	standard	1:1	1	25	20525/836.5	25.00	23.85	0.286	-0.030	1.30	0.373	/
Top Edge	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Bottom Edge	standard	1:1	1	25	20525/836.5	25.00	23.85	0.045	-0.070	1.30	0.058	/
Back Side	standard	1:1	50%	13	20525/836.5	24.00	22.77	0.478	-0.020	1.33	0.634	/
Front Side	standard	1:1	50%	13	20525/836.5	24.00	22.77	0.269	0.000	1.33	0.357	/
Left Edge	standard	1:1	50%	13	20525/836.5	24.00	22.77	0.227	0.010	1.33	0.301	/
Right Edge	standard	1:1	50%	13	20525/836.5	24.00	22.77	0.228	0.000	1.33	0.303	/
Top Edge	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Bottom Edge	standard	1:1	50%	13	20525/836.5	24.00	22.77	0.036	-0.120	1.33	0.047	/
Back Side	SIM2	1:1	1	25	20525/836.5	25.00	23.85	0.581	0.000	1.30	0.757	/
Back Side	Battery2	1:1	1	25	20525/836.5	25.00	23.85	0.609	0.010	1.30	0.794	22
Back Side	Battery3	1:1	1	25	20525/836.5	25.00	23.85	0.582	0.010	1.30	0.758	/
Note: 1.The value with blue color is the maximum SAR Value of each test band.												
2.For QPSK with 100% RB allocation, SAR is required when and the highest reported SAR for 1 RB and 50% RB allocation in are ≥ 50% limit(10g).												



3. Accessories that do not contain RF transmitters and have been proven to increase the peak SAR by less than 5 %, such as hands-free kits, do not need SAR tests separate from the SAR tests attached to a main EUT configuration.



Table 11: LTE Band 7

Test Position	Cover Type	Duty Cycle	RB allocation	RB offset	Channel/ Frequency (MHz)	Tune-up (dBm)	Measured power (dBm)	Limit of SAR 1.6 W/kg (mW/g)				Plot No.
								Measured SAR1g	Power Drift (dB)	Scaling Factor	Report SAR1g	
Head SAR (QPSK) (Receiver on)												
Left Cheek	standard	1:1	1	50	21100/2535	23.00	21.71	0.058	0.066	1.35	0.078	/
Left Tilt	standard	1:1	1	50	21100/2535	23.00	21.71	0.031	0.038	1.35	0.042	/
Right Cheek	standard	1:1	1	50	21100/2535	23.00	21.71	0.162	0.086	1.35	0.218	23
Right Tilt	standard	1:1	1	50	21100/2535	23.00	21.71	0.027	-0.090	1.35	0.037	/
Left Cheek	standard	1:1	50%	25	20850/2510	22.00	20.63	0.040	0.170	1.37	0.055	/
Left Tilt	standard	1:1	50%	25	20850/2510	22.00	20.63	0.021	0.022	1.37	0.028	/
Right Cheek	standard	1:1	50%	25	20850/2510	22.00	20.63	0.110	0.100	1.37	0.151	/
Right Tilt	standard	1:1	50%	25	20850/2510	22.00	20.63	0.015	0.051	1.37	0.021	/
Body-worn SAR (QPSK, Distance 15mm) (Receiver off)												
Back Side	standard	1:1	1	50	20850/2510	22.00	20.83	0.349	0.053	1.31	0.457	/
Front Side	standard	1:1	1	50	20850/2510	22.00	20.83	0.148	0.060	1.31	0.194	/
Back Side	standard	1:1	50%	25	20850/2510	22.00	20.71	0.363	0.084	1.35	0.489	24
Front Side	standard	1:1	50%	25	20850/2510	22.00	20.71	0.136	0.059	1.35	0.183	/
Hotspot SAR(QPSK, Distance 10mm) (Receiver off+hotspot on)												
Back Side	standard	1:1	1	50	21350/2560	20.00	18.75	0.456	0.032	1.33	0.608	/
Front Side	standard	1:1	1	50	21350/2560	20.00	18.75	0.175	0.043	1.33	0.233	/
Left Edge	standard	1:1	1	50	21350/2560	20.00	18.75	0.036	0.149	1.33	0.047	/
Right Edge	standard	1:1	1	50	21350/2560	20.00	18.75	0.048	0.033	1.33	0.064	/
Top Edge	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Bottom Edge	standard	1:1	1	50	21350/2560	20.00	18.75	0.506	0.130	1.33	0.675	/
Back Side	standard	1:1	50%	50	21100/2535	20.00	18.71	0.435	0.190	1.35	0.585	/
Front Side	standard	1:1	50%	50	21100/2535	20.00	18.71	0.185	0.110	1.35	0.249	/
Left Edge	standard	1:1	50%	50	21100/2535	20.00	18.71	0.032	0.028	1.35	0.043	/
Right Edge	standard	1:1	50%	50	21100/2535	20.00	18.71	0.044	0.061	1.35	0.059	/
Top Edge	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Bottom Edge	standard	1:1	50%	50	21100/2535	20.00	18.71	0.543	0.029	1.35	0.731	25

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

2. For 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(10g).



Table 12: Wi-Fi (2.4G)

Test Position	Cover Type	Mode 802.11b	Duty Cycle	Channel/ Frequency (MHz)	Tune-up dBm)	Measured power (dBm)	Limit of SAR 1.6 W/kg (mW/g)					Plot No.
							Area Scan SAR 1g	Zoom Scan SAR 1g	Power Drift (dB)	Scaling Factor	Report SAR 1g	
Head SAR												
Left Cheek	standard	DSSS	99.0%	1/2412	14.50	13.73	0.227	0.280	0.120	1.21	0.338	/
Left Tilt	standard	DSSS	99.0%	1/2412	14.50	13.73	0.161	0.183	0.020	1.21	0.221	/
Right Cheek	standard	DSSS	99.0%	1/2412	14.50	13.73	0.119	0.119	0.041	1.21	0.144	/
Right Tilt	standard	DSSS	99.0%	1/2412	14.50	13.73	0.106	0.114	0.050	1.21	0.137	/
Left Cheek	Battery2	DSSS	99.0%	1/2412	14.50	13.73	0.210	0.272	0.180	1.21	0.328	/
Left Cheek	Battery3	DSSS	99.0%	1/2412	14.50	13.73	0.243	0.299	0.020	1.21	0.361	26
Body-worn SAR (Distance 15mm)												
Back Side	standard	DSSS	99.0%	1/2412	18.00	17.14	0.092	0.094	0.048	1.23	0.116	27
Front Side	standard	DSSS	99.0%	1/2412	18.00	17.14	0.062	0.062	0.029	1.23	0.076	/
Back Side	Battery2	DSSS	99.0%	1/2412	18.00	17.14	0.076	0.074	0.110	1.23	0.091	/
Back Side	Battery3	DSSS	99.0%	1/2412	18.00	17.14	0.090	0.088	-0.040	1.23	0.108	/
Hotspot SAR(Distance 10mm)												
Back Side	standard	DSSS	99.0%	1/2412	18.00	17.14	0.168	0.169	0.051	1.23	0.208	/
Front Side	standard	DSSS	99.0%	1/2412	18.00	17.14	0.108	0.107	0.047	1.23	0.132	/
Left Edge	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Right Edge	standard	DSSS	99.0%	1/2412	18.00	17.14	0.069	0.084	0.070	1.23	0.104	/
Top Edge	standard	DSSS	99.0%	1/2412	18.00	17.14	0.086	0.088	0.150	1.23	0.108	/
Bottom Edge	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Back Side	Battery2	DSSS	99.0%	1/2412	18.00	17.14	0.147	0.139	0.140	1.23	0.171	/
Back Side	Battery3	DSSS	99.0%	1/2412	18.00	17.14	0.200	0.201	0.041	1.23	0.247	28
Note: 1. The value with blue color is the maximum SAR Value of each test band.												
2. Accessories that do not contain RF transmitters and have been proven to increase the peak SAR by less than 5 %, such as hands-free kits, do not need SAR tests separate from the SAR tests attached to a main EUT configuration.												

MAX Adjusted SAR							
Mode	Test Position	Channel/Frequency (MHz)	MAX Reported SAR _{1g} (W/kg)	802.11b Tune-up limit (dBm)	Tune-up limit (dBm)	Scaling Factor	Adjusted SAR _{1g} (W/kg)
802.11g	Left Cheek	1/2412	0.361	14.50	14.50	1.00	0.361
802.11n HT20	Left Cheek	1/2412	0.361	14.50	14.50	1.00	0.361
802.11n HT40	Left Cheek	1/2412	0.361	14.50	14.50	1.00	0.361
802.11g	Back Side (Battery3)	1/2412	0.247	18.00	17.50	0.89	0.220
802.11n HT20	Back Side (Battery3)	1/2412	0.247	18.00	17.00	0.79	0.196
802.11n HT40	Back Side (Battery3)	1/2412	0.247	18.00	16.00	0.63	0.156
Note: SAR is not required for OFDM when the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.							

Table 13: BT

Test Position	Cover Type	Mode	Duty Cycle	Channel/ Frequency (MHz)	Tune-up dBm)	Measured power (dBm)	Limit of SAR 1.6 W/kg (mW/g)				Plot No.
							Measured SAR1g	Power Drift (dB)	Scaling Factor	Report SAR 1g	
Head SAR											
Left Cheek	standard	GFSK	46.2%	0/2402	12.00	9.99	0.111	0.068	3.44	0.382	29
Left Tilt	standard	GFSK	46.2%	0/2402	12.00	9.99	0.090	0.050	3.44	0.311	/
Right Cheek	standard	GFSK	46.2%	0/2402	12.00	9.99	0.054	0.023	3.44	0.184	/
Right Tilt	standard	GFSK	46.2%	0/2402	12.00	9.99	0.058	0.090	3.44	0.199	/
Note: 1. The value with blue color is the maximum SAR Value of each test band.											

Band	Configuration	Frequency (MHz)	Maximum Power (dBm)	Separation Distance (mm)	Estimated SAR (W/kg)
Bluetooth	Body-worn	2480	12	15	0.222
	Hotspot SAR	2480	12	10	0.333
<p>For simultaneous transmission analysis, Bluetooth SAR is estimated per KDB 447498 D01 based on the formula below.</p> <p>(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm) · [$\sqrt{f(\text{GHz})/x}$] W/kg for test separation distances ≤ 50 mm; where x = 7.5 for 1-g SAR, and x = 18.75 for 10-g SAR.</p>					

10.4 Simultaneous Transmission Analysis

Simultaneous TX Combination	Head	Body-worn	Hotspot
GSM Voice+ BT	Yes	Yes	N/A
GSM DATA + BT	N/A	Yes	N/A
GSM Voice + Wi-Fi 2.4G	Yes	Yes	N/A
GSM DATA + Wi-Fi 2.4G	N/A	Yes	Yes
UMTS Voice + BT	Yes	Yes	N/A
UMTS Data + BT	yes	Yes	N/A
UMTS Voice+ Wi-Fi 2.4G	Yes	Yes	N/A
UMTS Data + Wi-Fi 2.4G	yes	Yes	Yes
LTE + Wi-Fi 2.4G	Yes	Yes	Yes
LTE+ BT	Yes	Yes	N/A
Wi-Fi 2.4G+ BT	N/A	N/A	N/A

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 $[(x_1-x_2)^2 + (y_1-y_2)^2 + (z_1-z_2)^2]$, where (x_1, y_1, z_1) and (x_2, y_2, z_2) 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**

Test Position		SAR _{1g} (W/kg)	GSM 850	GSM 1900	WCDMA Band V	LTE FDD 5	LTE FDD 7	MAX. SAR _{1g}
Left Cheek			0.471	0.327	0.486	0.362	0.078	0.486
Left Tilt			0.331	0.142	0.273	0.227	0.042	0.331
Right Cheek			0.457	0.208	0.457	0.396	0.218	0.457
Right Tilt			0.265	0.136	0.310	0.250	0.037	0.310
Body worn	Back Side		0.516	0.219	0.577	0.717	0.489	0.717
	Front Side		0.484	0.211	0.426	0.438	0.194	0.484
Hotspot	Back Side		0.612	0.197	0.661	0.794	0.608	0.794
	Front Side		0.343	0.191	0.427	0.435	0.249	0.435
	Left Edge		0.291	0.218	0.426	0.364	0.047	0.426
	Right Edge		0.304	0.073	0.412	0.373	0.064	0.412
	Top Edge		N/A	N/A	N/A	N/A	N/A	N/A
	Bottom Edge		0.044	0.144	0.052	0.058	0.731	0.731

About BT and Main- Antenna

SAR _{1g} (W/kg)		Main-antenna	BT	MAX. Σ SAR _{1g}
Test Position				
Left Cheek		0.486	0.382	0.868
Left Tilt		0.331	0.305	0.636
Right Cheek		0.457	0.181	0.638
Right Tilt		0.310	0.196	0.506
Body worn	Back Side	0.717	0.222	0.939
	Front Side	0.484	0.222	0.706
Note: 1.The value with blue color is the maximum Σ SAR _{1g} Value. 2.MAX. Σ SAR _{1g} =Unlicensed SAR _{MAX} +Licensed SAR _{MAX}				

MAX. Σ SAR_{1g} =0.939W/kg<1.6W/kg, so the Simultaneous transimition SAR with volum scan are not required for BT and Main-Antenna.

About Wi-Fi and Main-Antenna

SAR _{1g} (W/kg)		Main-antenna	Wi-Fi 2.4G	MAX. Σ SAR _{1g}
Test Position				
Left, Cheek		0.486	0.361	0.847
Left, Tilt		0.331	0.221	0.552
Right, Cheek		0.457	0.144	0.601
Right, Tilt		0.310	0.137	0.447
Body worn 1g	Back Side	0.717	0.116	0.833
	Front Side	0.484	0.076	0.560
Hotspot 1g	Back Side	0.794	0.247	1.041
	Front Side	0.435	0.132	0.567
	Left Edge	0.426	N/A	0.426
	Right Edge	0.412	0.104	0.516
	Top Edge	N/A	0.108	0.108
	Bottom Edge	0.731	N/A	0.731
Note: 1.The value with blue color is the maximum Σ SAR _{1g} Value. 2.MAX. Σ SAR _{1g} =Unlicensed SAR _{MAX} +Licensed SAR _{MAX}				

MAX. Σ SAR_{1g} =1.041W/kg<1.6W/kg, so the Simultaneous transimition SAR with volum scan are not required for Wi-Fi and Main-Antenna.

Conclusion:

According to the KDB 690783 D01 section 1) d) i), when the sum of 1-g SAR applies for simultaneous transmission SAR test exclusion, the highest sum of 1-g SAR according to the highest reported stand-alone SAR values is used, and the highest Reported SAR for simultaneous transmission exposure conditions is 1.041 W/kg

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 835 MHz Head TSL

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2

Date: 4/9/2019

Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 0.91 \text{ S/m}$; $\epsilon_r = 42.0$; $\rho = 1000 \text{ kg/m}^3$

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

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(9.10, 9.10, 9.10); Calibrated: 5/29/2018;

Electronics: DAE4 SN1291; Calibrated: 12/4/2018

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

d=15mm, Pin=250mW/Area Scan (41x121x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 2.64 mW/g

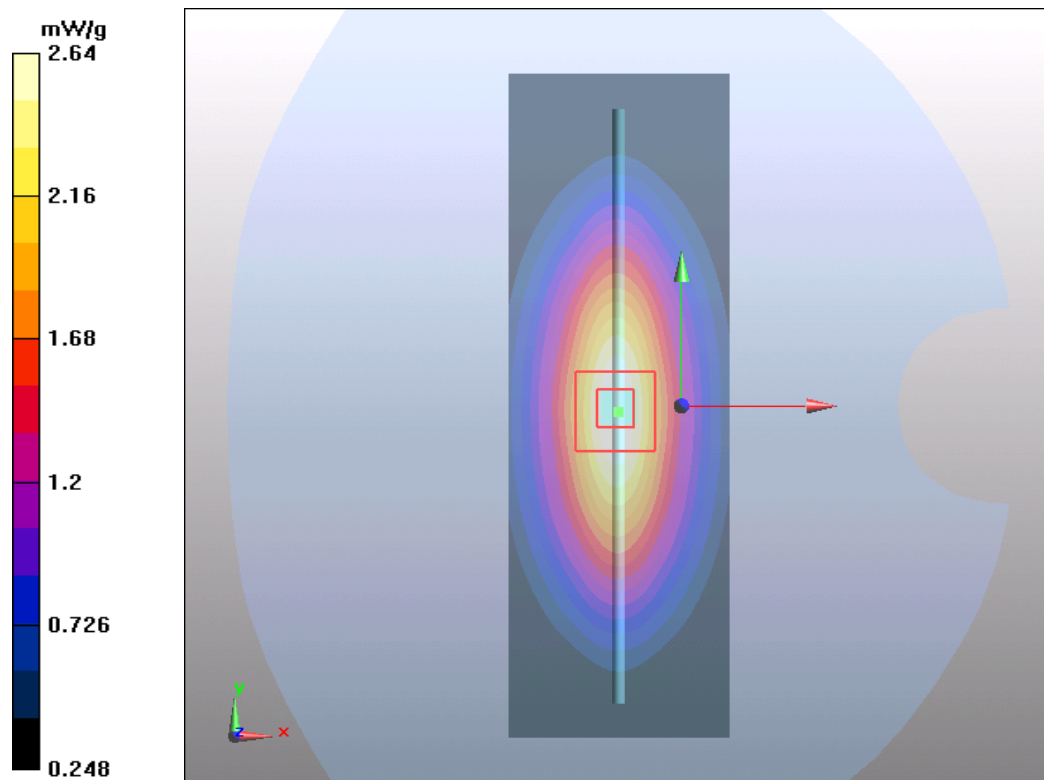
d=15mm, Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 54.4 V/m; Power Drift = -0.076 dB

Peak SAR (extrapolated) = 3.67 W/kg

SAR(1 g) = 2.44 mW/g; SAR(10 g) = 1.6 mW/g

Maximum value of SAR (measured) = 2.64 mW/g



Plot 2 System Performance Check at 835 MHz Body TSL

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2

Date: 4/11/2019

Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 0.97 \text{ S/m}$; $\epsilon_r = 53.8$; $\rho = 1000 \text{ kg/m}^3$

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

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(9.32, 9.32, 9.32); Calibrated: 5/29/2018;

Electronics: DAE4 SN1291; Calibrated: 12/4/2018

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

d=15mm, Pin=250mW/Area Scan (41x121x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (interpolated) = 2.58 mW/g

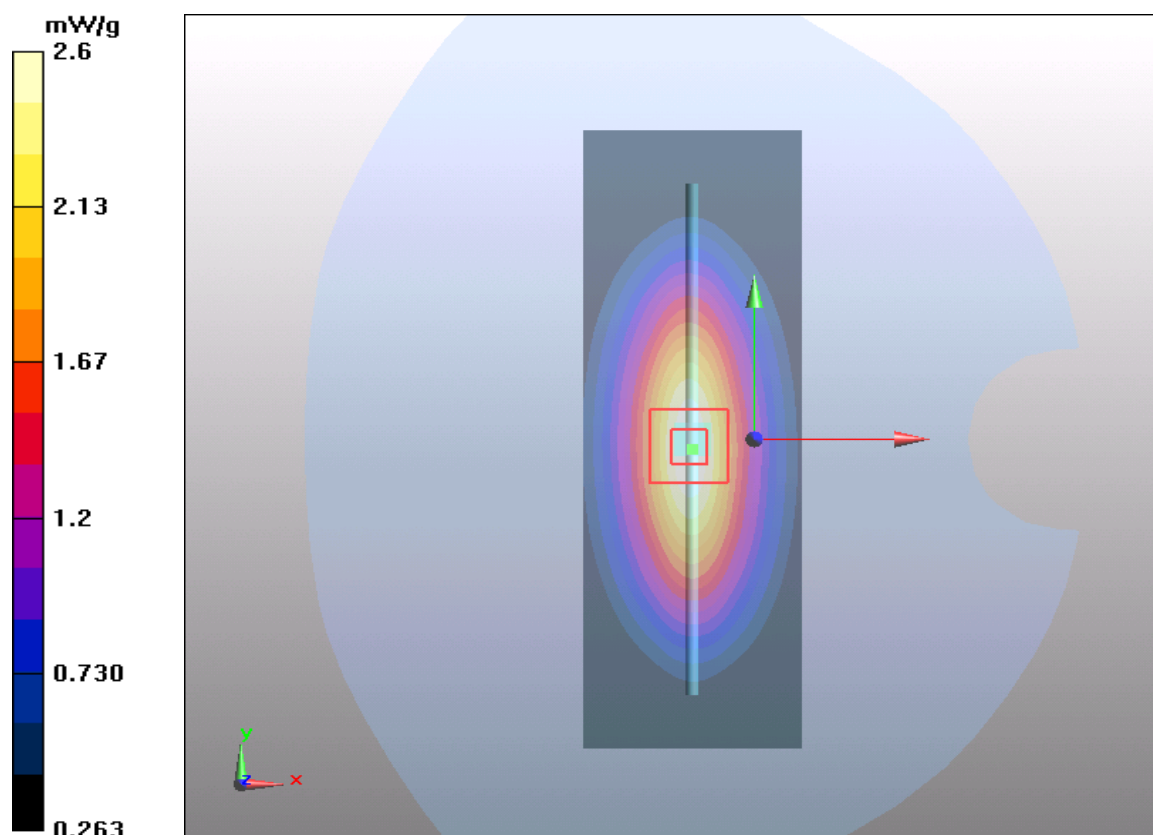
d=15mm, Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 51.9 V/m ; Power Drift = -0.058 dB

Peak SAR (extrapolated) = 3.5 W/kg

SAR(1 g) = 2.41 mW/g ; SAR(10 g) = 1.6 mW/g

Maximum value of SAR (measured) = 2.6 mW/g



Plot 3 System Performance Check at 1900 MHz Head TSL

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

Date: 4/13/2019

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

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.39$ S/m; $\epsilon_r = 40.7$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C

Liquid Temperature: 21.5 °C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.96, 7.96, 7.96); Calibrated: 5/29/2018;

Electronics: DAE4 SN1291; Calibrated: 12/4/2018

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

d=10mm, Pin=250mW/Area Scan (41x71x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 11.3 mW/g

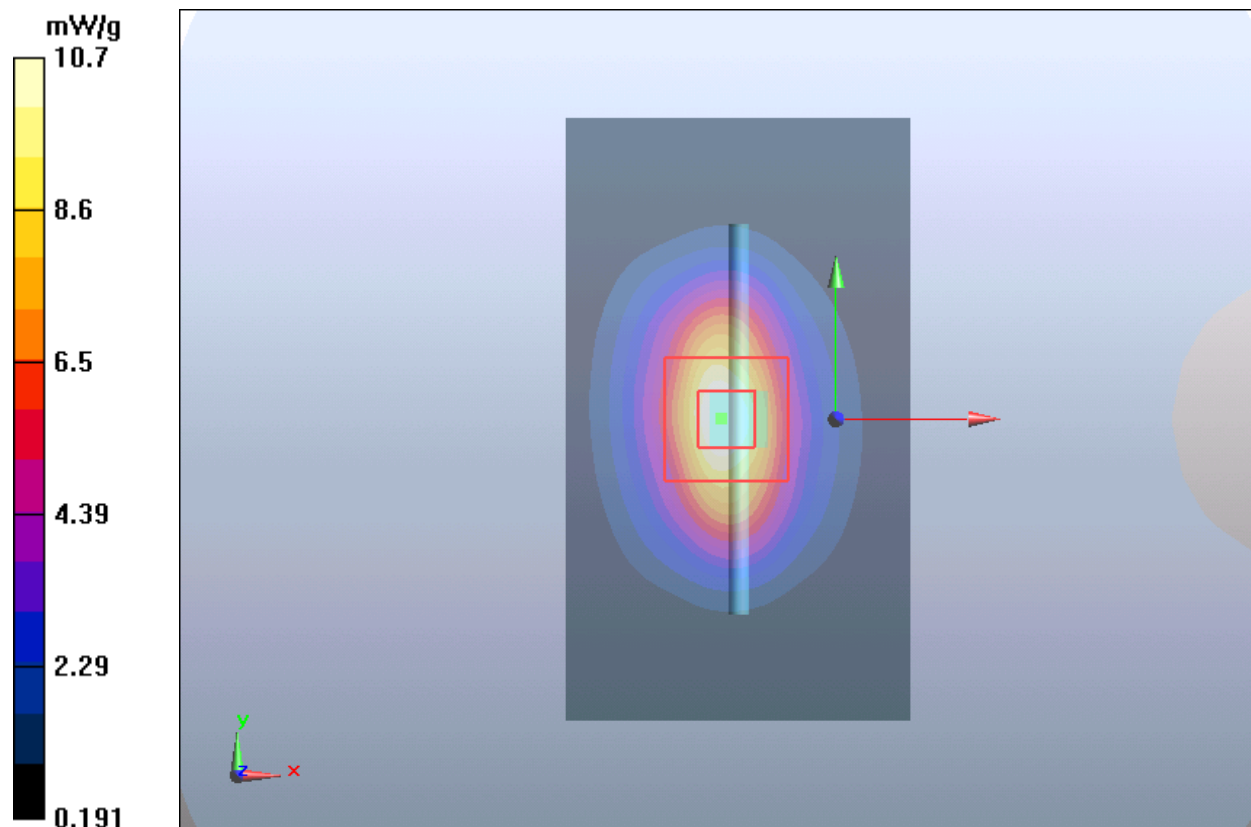
d=10mm, Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 85.5 V/m; Power Drift = 0.028 dB

Peak SAR (extrapolated) = 17.8 W/kg

SAR(1 g) = 9.88 mW/g; SAR(10 g) = 4.9 mW/g

Maximum value of SAR (measured) = 10.7 mW/g



Plot 4 System Performance Check at 1900 MHz Body TSL

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

Date: 4/13/2019

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

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.51$ S/m; $\epsilon_r = 52.8$; $\rho = 1000$ kg/m³

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

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.70, 7.70, 7.70); Calibrated: 5/29/2018;

Electronics: DAE4 SN1291; Calibrated: 12/4/2018

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

d=10mm, Pin=250mW/Area Scan (41x71x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 12.2 mW/g

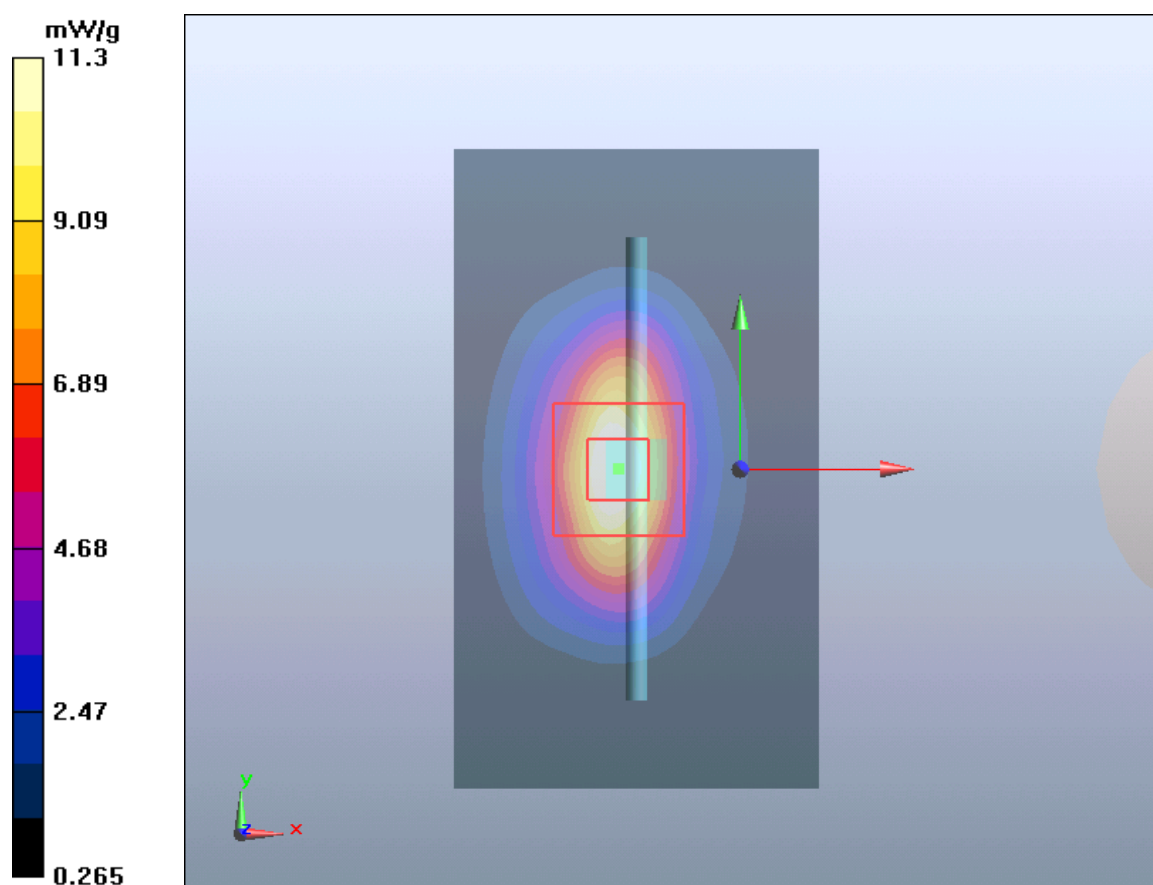
d=10mm, Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 82.3 V/m; Power Drift = 0.068 dB

Peak SAR (extrapolated) = 17.8 W/kg

SAR(1 g) = 9.93 mW/g; SAR(10 g) = 5.25 mW/g

Maximum value of SAR (measured) = 11.3 mW/g



Plot 5 System Performance Check at 1900 MHz Body TSL

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

Date: 4/13/2019

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

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.51$ S/m; $\epsilon_r = 52.8$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C

Liquid Temperature: 21.5 °C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.70, 7.70, 7.70); Calibrated: 5/29/2018;

Electronics: DAE4 SN1291; Calibrated: 12/4/2018

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

d=10mm, Pin=250mW/Area Scan (61x101x1): Interpolated grid: dx=10 mm, dy=10 mm

Maximum value of SAR (interpolated) = 11.21 W/kg

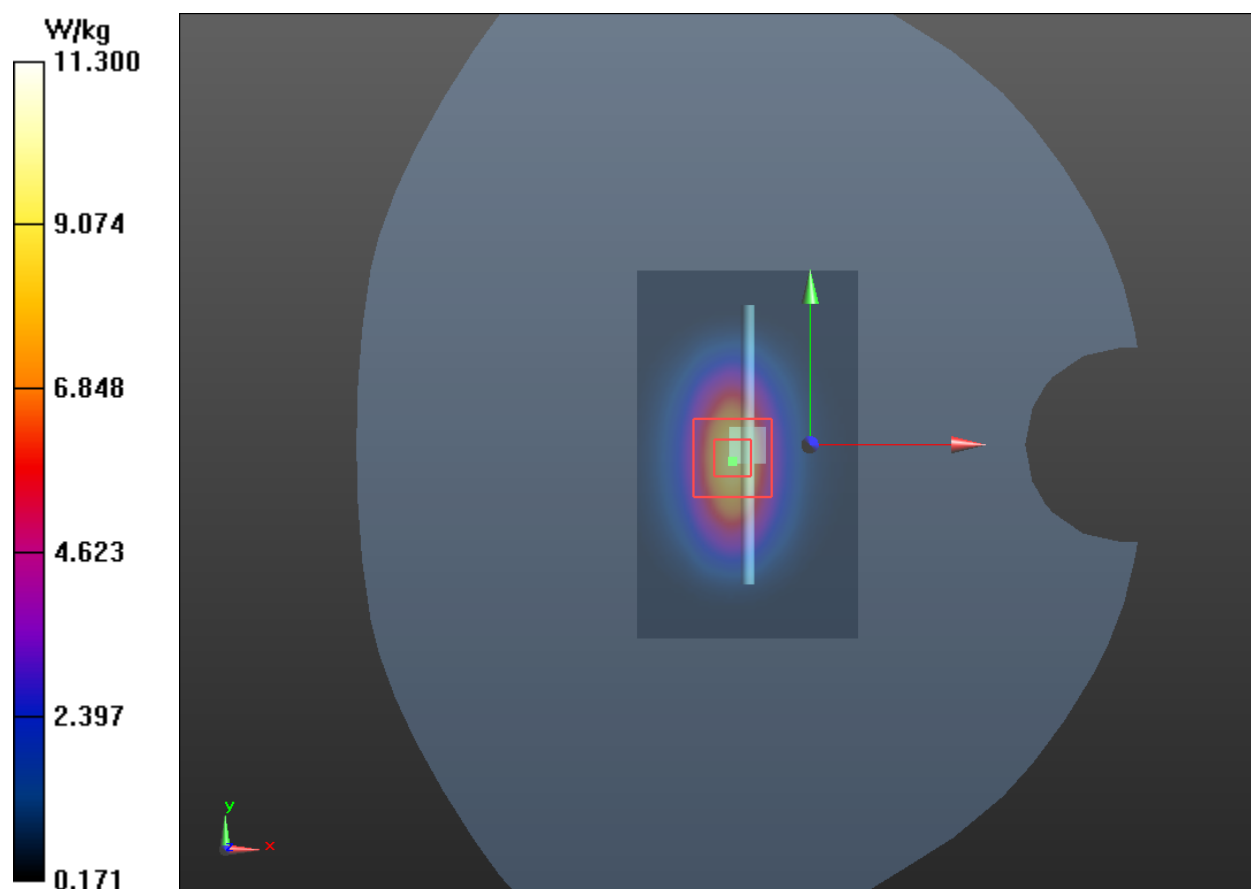
d=10mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 73.65 V/m; Power Drift = 0.15 dB

Peak SAR (extrapolated) = 17.6 W/kg

SAR(1 g) = 10.02 W/kg; SAR(10 g) = 5.36 W/kg

Maximum value of SAR (measured) = 11.30 W/kg



Plot 6 System Performance Check at 2450 MHz Head TSL

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

Date: 4/13/2019

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

Medium parameters used: $f = 2450$ MHz; $\sigma = 1.86$ S/m; $\epsilon_r = 38.7$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C

Liquid Temperature: 21.5 °C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.57, 7.57, 7.57); Calibrated: 5/29/2018;

Electronics: DAE4 SN1291; Calibrated: 12/4/2018

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

d=10mm, Pin=250mW/Area Scan (41x71x1): Measurement grid: dx=12mm, dy=12mm

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

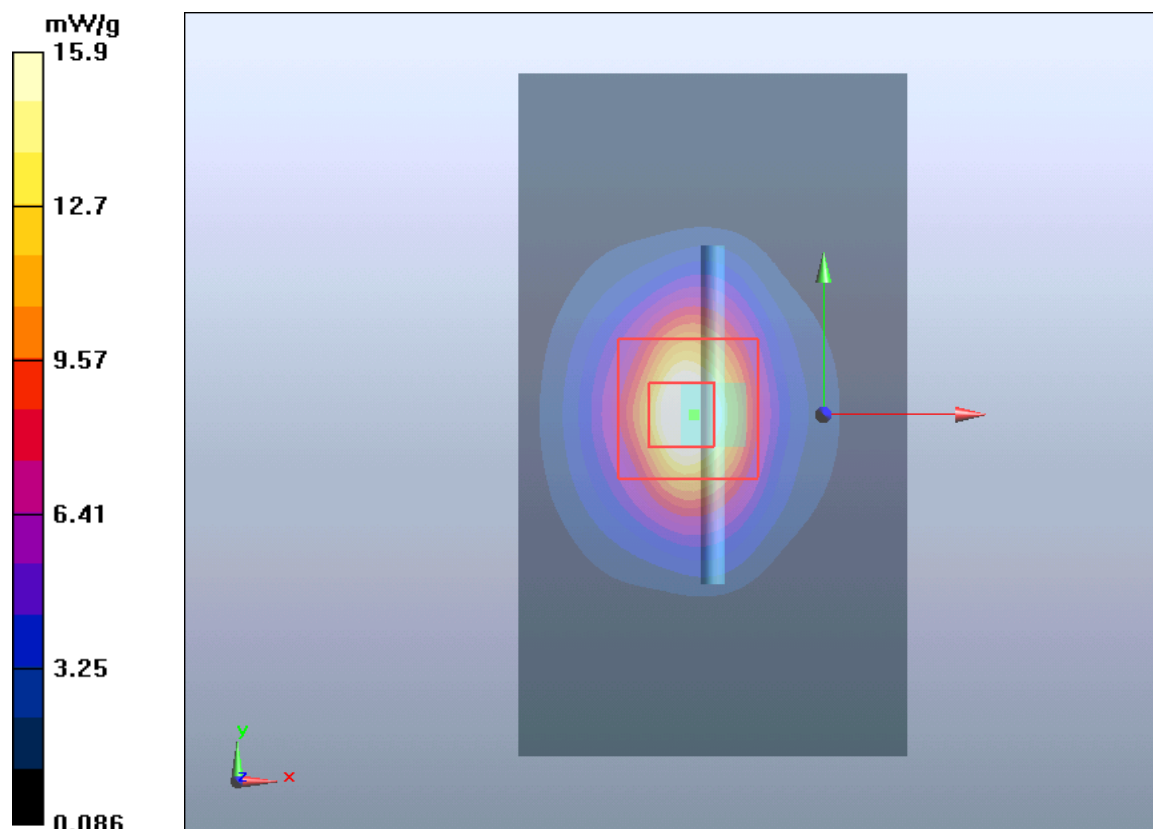
d=10mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

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 7 System Performance Check at 2450 MHz Body TSL

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

Date: 4/13/2019

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

Medium parameters used: $f = 2450$ MHz; $\sigma = 1.97$ S/m; $\epsilon_r = 51.1$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C

Liquid Temperature: 21.5 °C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.53, 7.53, 7.53); Calibrated: 5/29/2018;

Electronics: DAE4 SN1291; Calibrated: 12/4/2018

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

d=10mm, Pin=250mW/Area Scan (41x71x1): Measurement grid: dx=12mm, dy=12mm

Maximum value of SAR (interpolated) = 16 mW/g

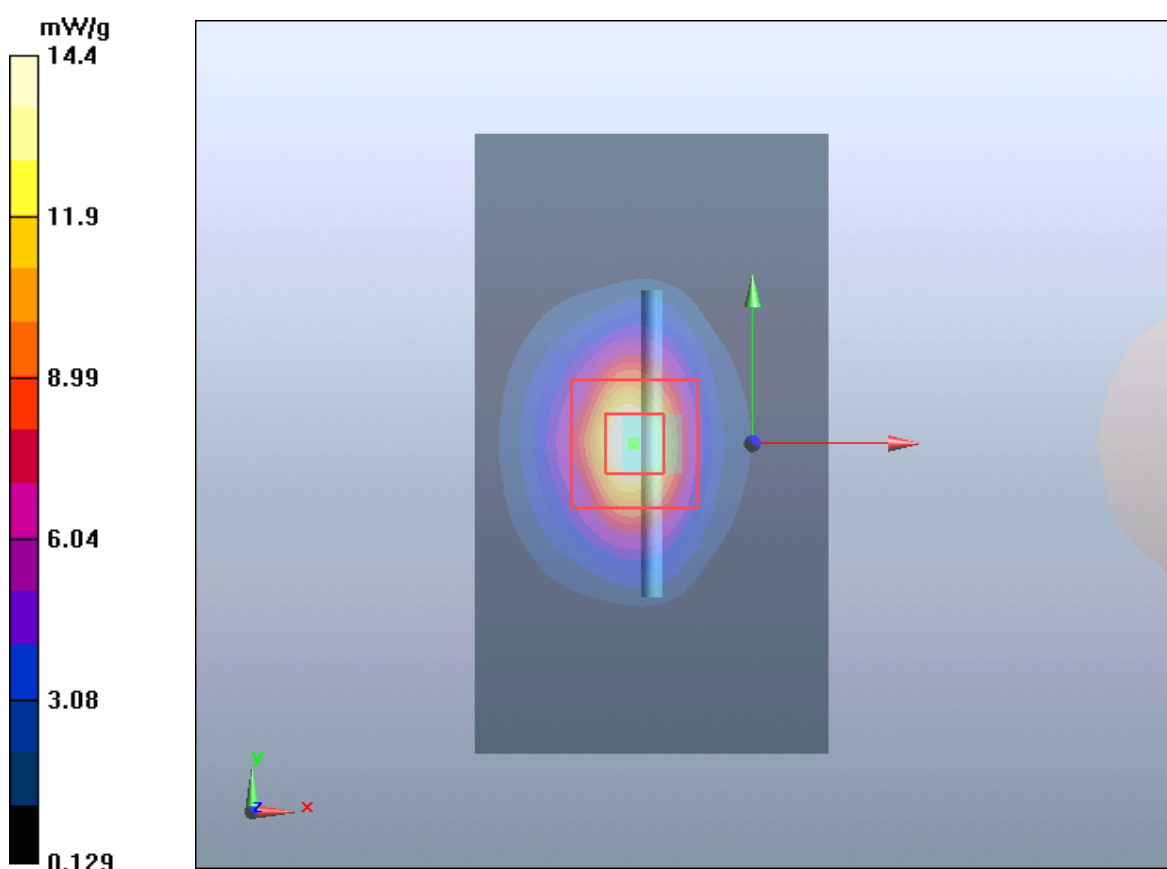
d=10mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 81.2 V/m; Power Drift = 0.003 dB

Peak SAR (extrapolated) = 25.4 W/kg

SAR(1 g) = 12.5 mW/g; SAR(10 g) = 6.20 mW/g

Maximum value of SAR (measured) = 14.4 mW/g



Plot 8 System Performance Check at 2600 MHz Head TSL

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

Date: 4/9/2019

Communication System: CW; Frequency: 2600 MHz

Medium parameters used: $f = 2600$ MHz; $\sigma = 2.02$ S/m; $\epsilon_r = 38.1$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.28, 7.28, 7.28); Calibrated: 5/29/2018;

Electronics: DAE4 SN1291; Calibrated: 12/4/2018

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

d=10mm, Pin=250mW/Area Scan (41x71x1): Measurement grid:dx=12mm, dy=12mm

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

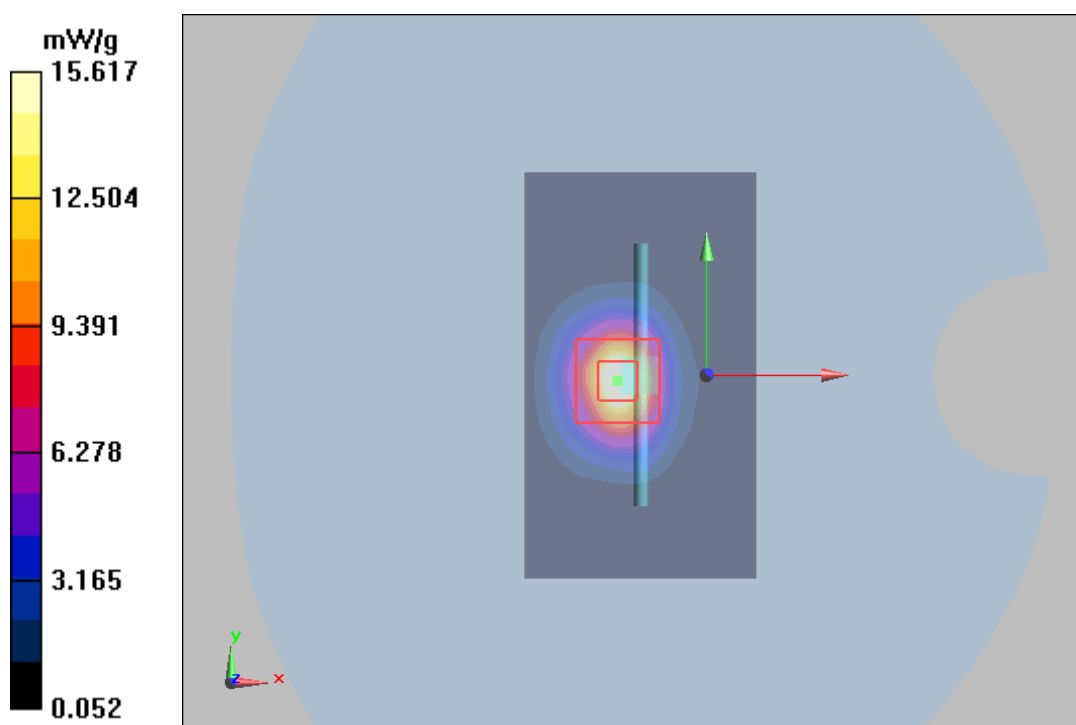
d=10mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

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) = 6.07 mW/g

Maximum value of SAR (measured) = 15.617 mW/g



Plot 9 System Performance Check at 2600 MHz Body TSL

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

Date: 4/9/2019

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

Medium parameters used: $f = 2600$ MHz; $\sigma = 2.16$ S/m; $\epsilon_r = 50.7$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C

Liquid Temperature: 21.5 °C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.16, 7.16, 7.16); Calibrated: 5/29/2018;

Electronics: DAE4 SN1291; Calibrated: 12/4/2018

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

d=10mm, Pin=250mW /Area Scan (41x71x1): Measurement grid: dx=12mm, dy=12mm

Maximum value of SAR (interpolated) = 17.7 mW/g

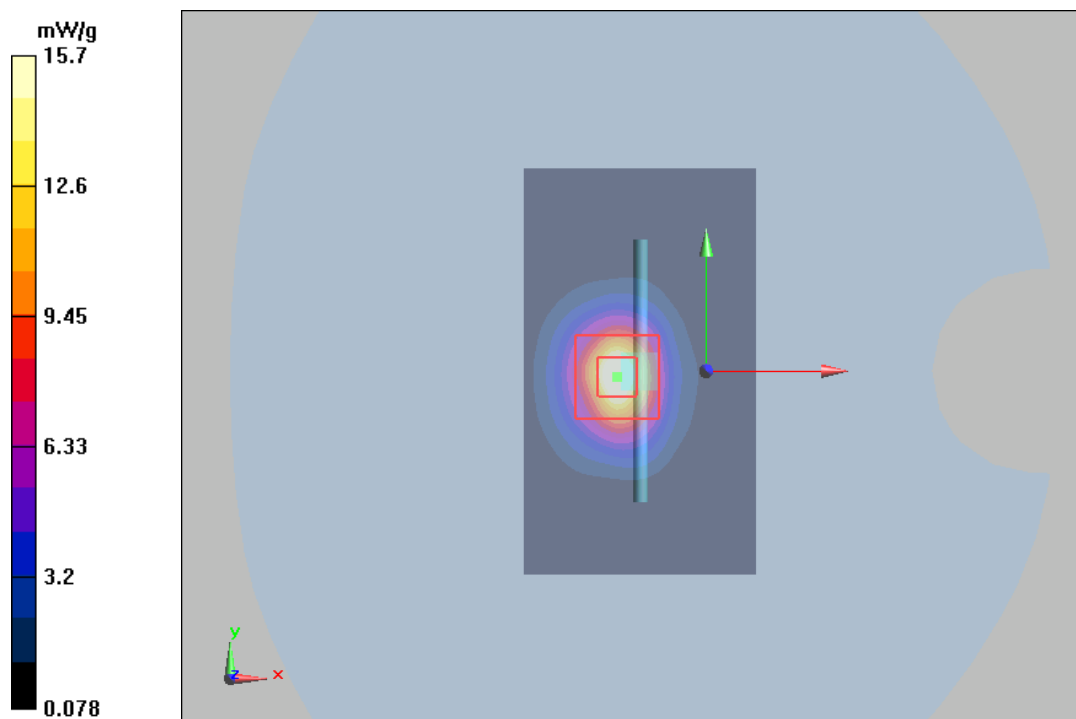
d=10mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 74 V/m; Power Drift = -0.0027 dB

Peak SAR (extrapolated) = 28.5 W/kg

SAR(1 g) = 13.5 mW/g; SAR(10 g) = 5.99 mW/g

Maximum value of SAR (measured) = 15.7 mW/g



Plot 10 System Performance Check at 2600 MHz Body TSL

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

Date: 4/9/2019

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

Medium parameters used: $f = 2600$ MHz; $\sigma = 2.16$ S/m; $\epsilon_r = 50.7$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C

Liquid Temperature: 21.5 °C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.16, 7.16, 7.16); Calibrated: 5/29/2018;

Electronics: DAE4 SN1291; Calibrated: 12/4/2018

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

d=10mm, Pin=250mW /Area Scan (61x101x1): Interpolated grid: dx=10 mm, dy=10 mm

Maximum value of SAR (interpolated) = 15.2 W/kg

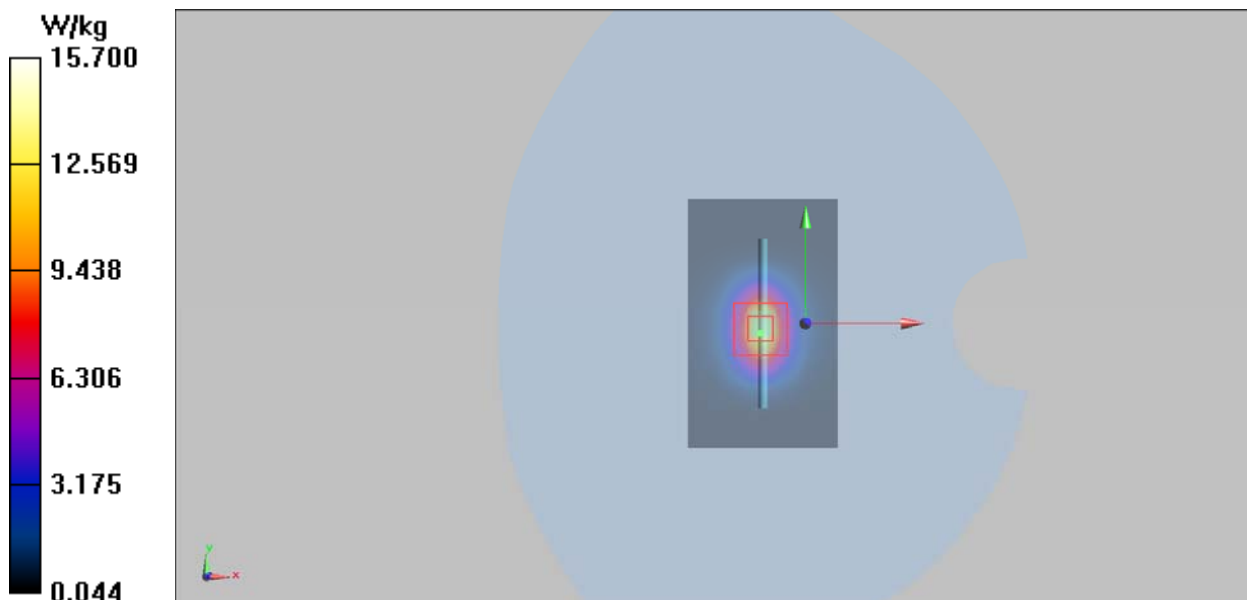
d=10mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 80.11 V/m; Power Drift = -0.040 dB

Peak SAR (extrapolated) = 35.1 W/kg

SAR(1 g) = 13.67 W/kg; SAR(10 g) = 6.33 W/kg

Maximum value of SAR (measured) = 15.700 W/kg



ANNEX C: Highest Graph Results

Plot 11 GSM 850 Left Cheek Middle

Date: 4/9/2019

Communication System: UID 0, GSM (0); Frequency: 836.6 MHz; Duty Cycle: 1:8.30042

Medium parameters used: $f = 837$ MHz; $\sigma = 0.916$ S/m; $\epsilon_r = 41.951$; $\rho = 1000$ kg/m³

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

Phantom section: Left Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(9.10, 9.10, 9.10); Calibrated: 5/29/2018;

Electronics: DAE4 SN1291; Calibrated: 12/4/2018

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Left Cheek Middle/Area Scan (71x121x1): Interpolated grid: dx=15 mm, dy=15 mm

Maximum value of SAR (interpolated) = 0.398 W/kg

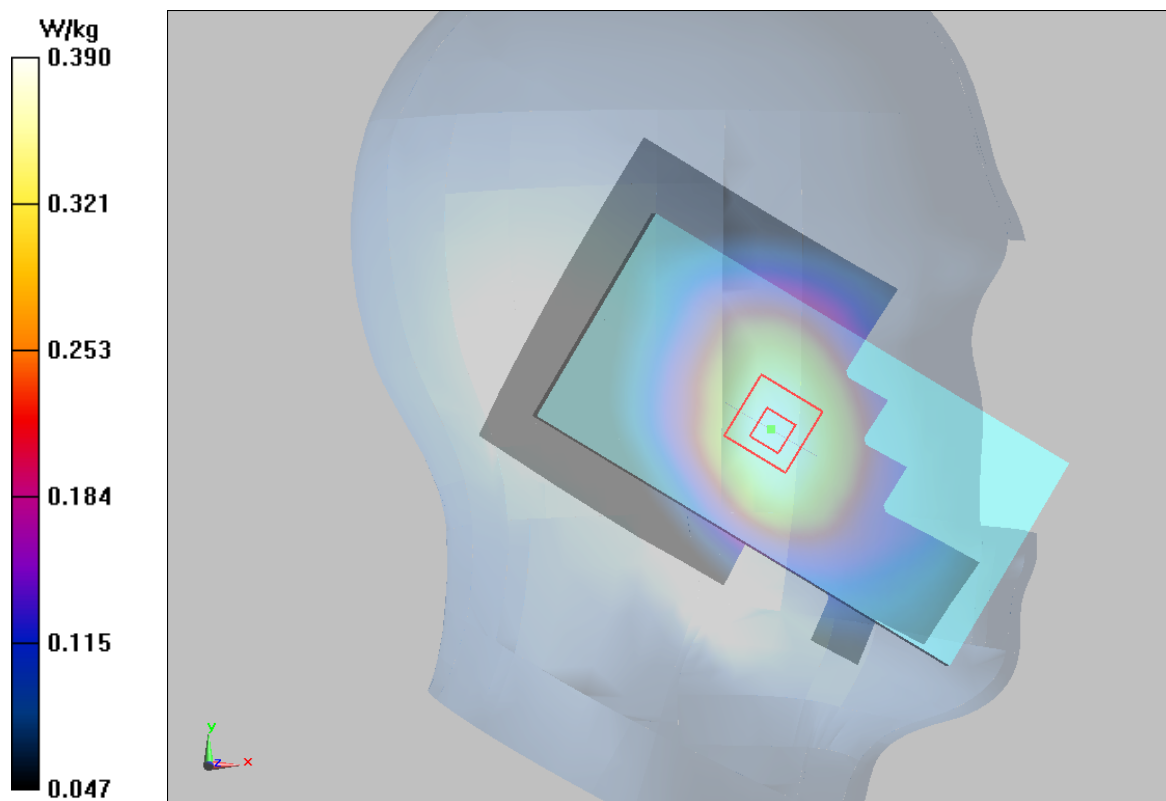
Left Cheek Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 6.603 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 0.465 W/kg

SAR(1 g) = 0.369 W/kg; SAR(10 g) = 0.281 W/kg

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



Plot 12 GSM 850 Back Side Middle (Distance 15mm)

Date: 4/11/2019

Communication System: UID 0, GSM 850 (0); Frequency: 836.6 MHz; Duty Cycle: 1:8.30042

Medium parameters used: $f = 836.6$ MHz; $\sigma = 0.974$ S/m; $\epsilon_r = 53.795$; $\rho = 1000$ kg/m³

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

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(9.32, 9.32, 9.32); Calibrated: 5/29/2018;

Electronics: DAE4 SN1291; Calibrated: 12/4/2018

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Back Side Middle/Area Scan (71x121x1): Interpolated grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.423 W/kg

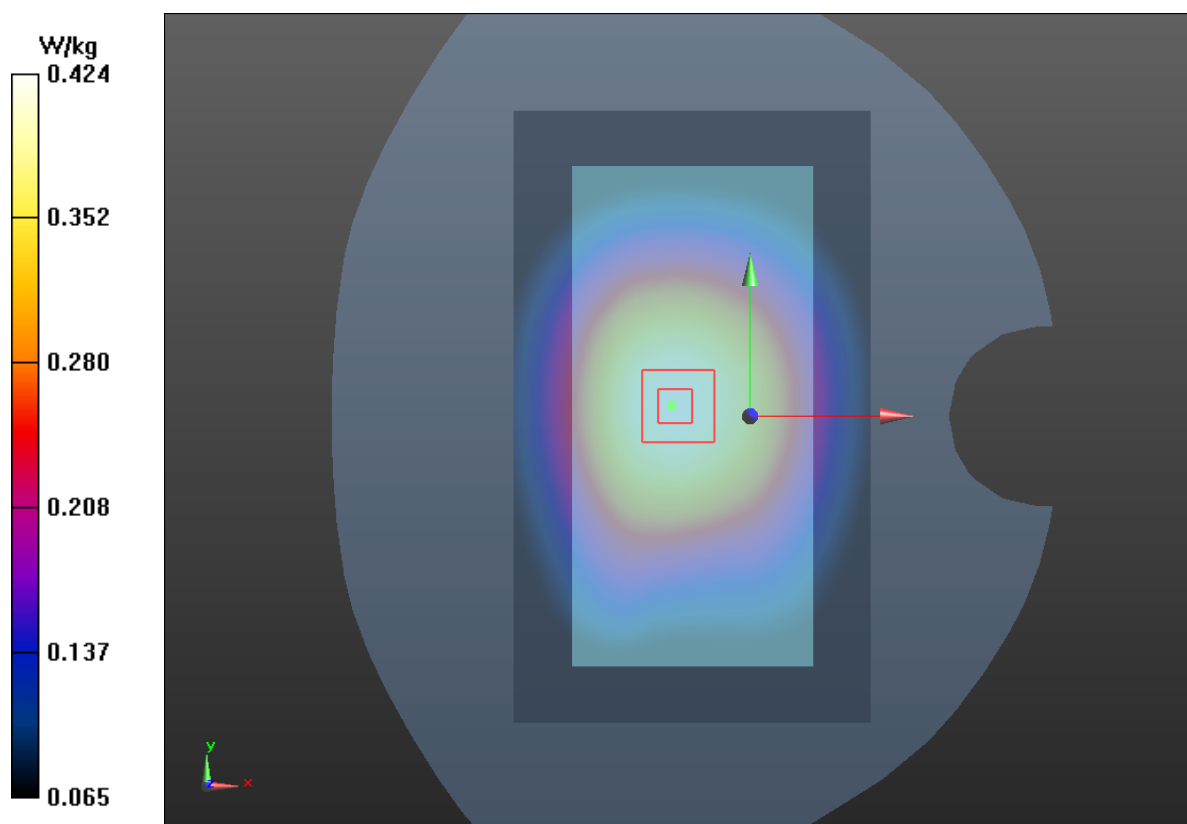
Back Side Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 20.83 V/m; Power Drift = 0.070 dB

Peak SAR (extrapolated) = 0.501 W/kg

SAR(1 g) = 0.404 W/kg; SAR(10 g) = 0.307 W/kg

Maximum value of SAR (measured) = 0.424 W/kg



Plot 13 GSM 850 GPRS (4Txslots) Back Side Middle (Distance 10mm)

Date: 4/11/2019

Communication System: UID 0, GPRS 4TX (0); Frequency: 836.6 MHz; Duty Cycle: 1:2.07491

Medium parameters used: $f = 836.6 \text{ MHz}$; $\sigma = 0.974 \text{ S/m}$; $\epsilon_r = 53.795$; $\rho = 1000 \text{ kg/m}^3$

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

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(9.32, 9.32, 9.32); Calibrated: 5/29/2018;

Electronics: DAE4 SN1291; Calibrated: 12/4/2018

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Back Side Middle /Area Scan (71x121x1): Interpolated grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.496 W/kg

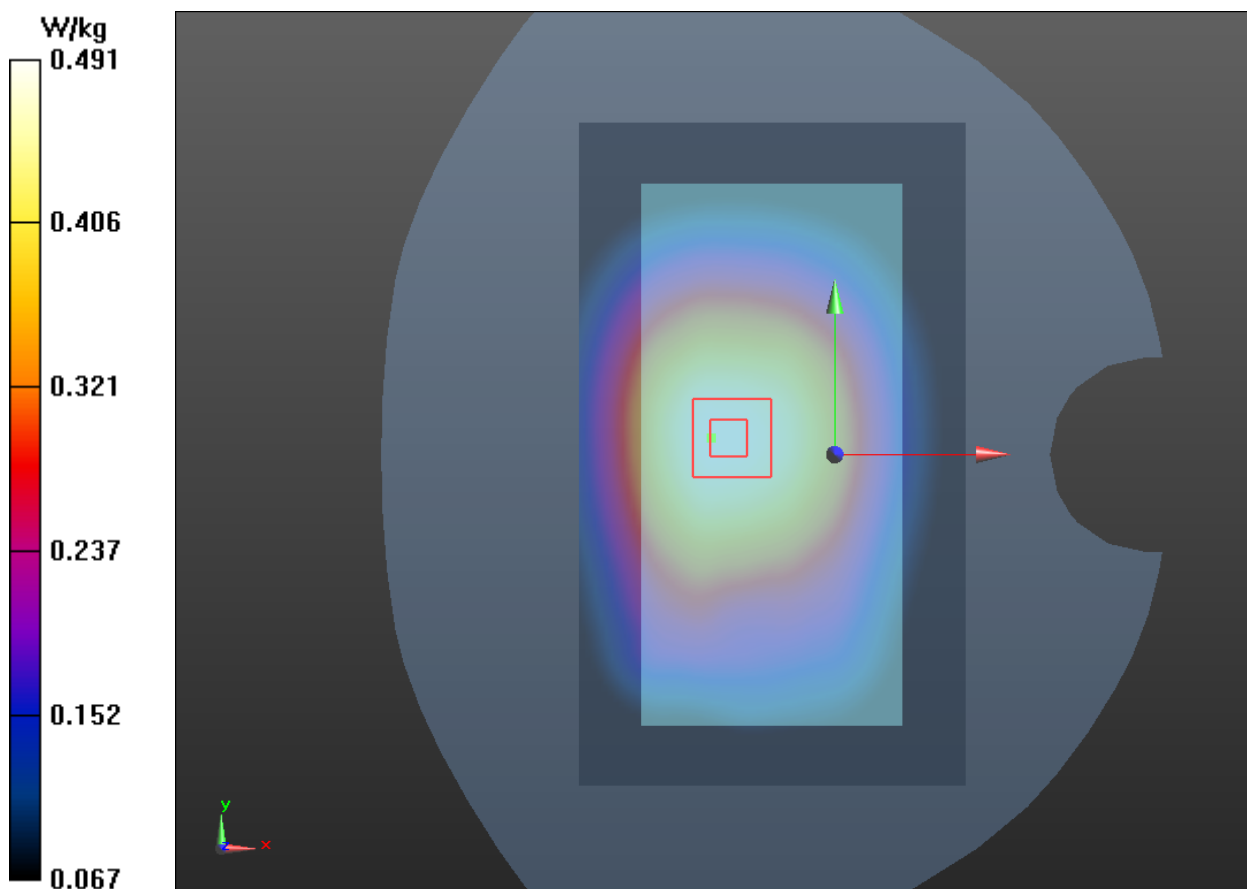
Back Side Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 22.11 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 0.582 W/kg

SAR(1 g) = 0.470 W/kg; SAR(10 g) = 0.360 W/kg

Maximum value of SAR (measured) = 0.491 W/kg



Plot 14 GSM 1900 Left Cheek Middle

Date: 4/13/2019

Communication System: UID 0, GSM 1900 (0); Frequency: 1880 MHz; Duty Cycle: 1:8.30042

Medium parameters used: $f = 1880$ MHz; $\sigma = 1.393$ S/m; $\epsilon_r = 38.344$; $\rho = 1000$ kg/m³

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

Phantom section: Left Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.96, 7.96, 7.96); Calibrated: 5/29/2018;

Electronics: DAE4 SN1291; Calibrated: 12/4/2018

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Left Cheek Middle/Area Scan (71x121x1): Interpolated grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.304 W/kg

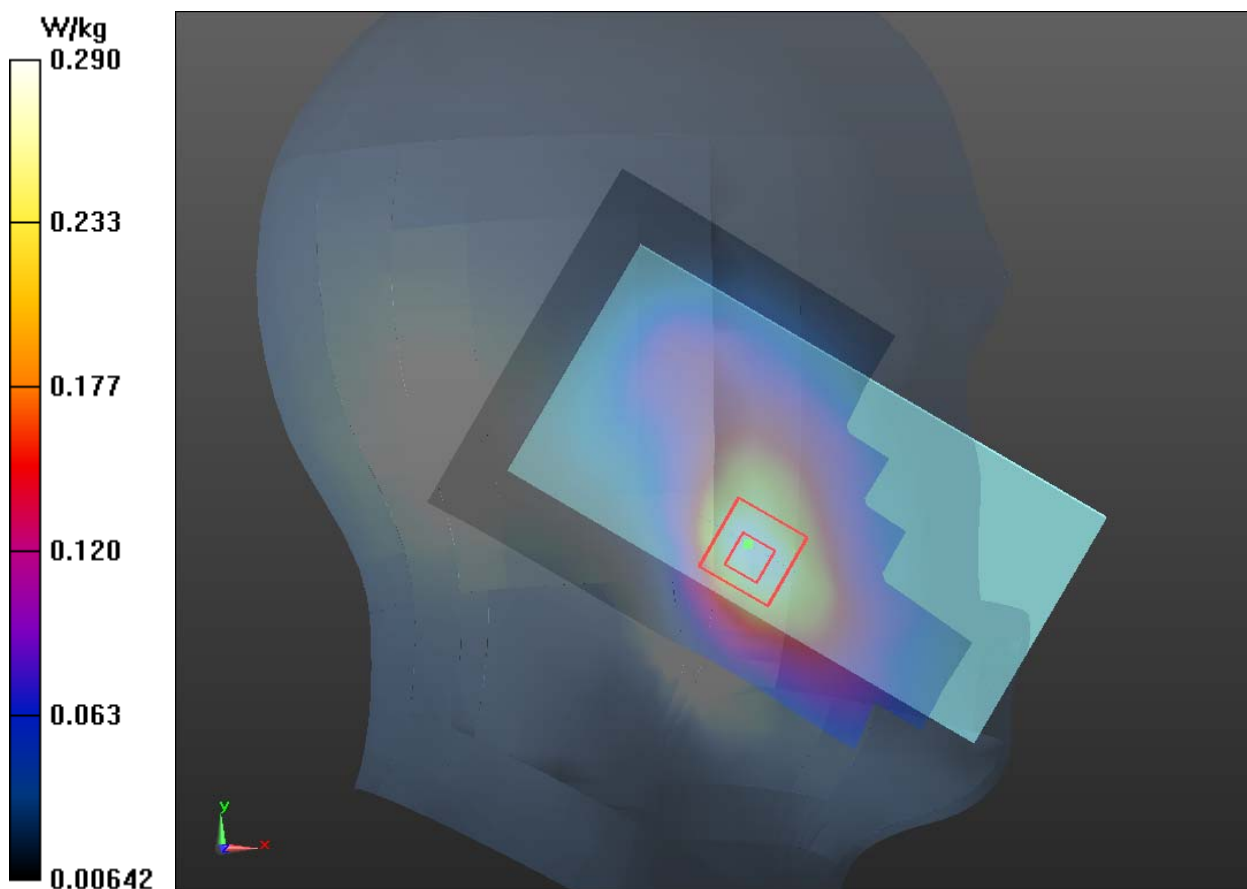
Left Cheek Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 4.852 V/m; Power Drift = 0.031 dB

Peak SAR (extrapolated) = 0.416 W/kg

SAR(1 g) = 0.273 W/kg; SAR(10 g) = 0.171 W/kg

Maximum value of SAR (measured) = 0.290 W/kg



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

Date: 4/13/2019

Communication System: UID 0, GSM 1900 (0); Frequency: 1880 MHz; Duty Cycle: 1:8.30042

Medium parameters used: $f = 1880$ MHz; $\sigma = 1.489$ S/m; $\epsilon_r = 52.896$; $\rho = 1000$ kg/m³

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

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.70, 7.70, 7.70); Calibrated: 5/29/2018;

Electronics: DAE4 SN1291; Calibrated: 12/4/2018

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Back Side Middle/Area Scan (71x121x1): Interpolated grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.196 W/kg

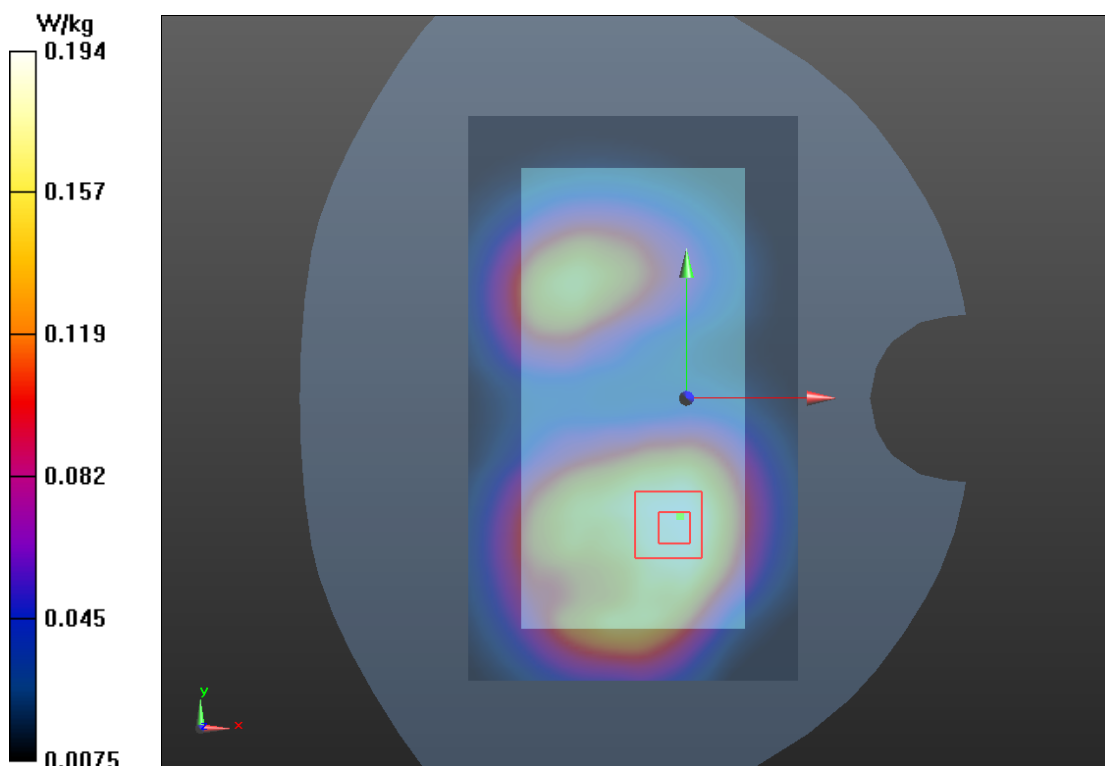
Back Side Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 4.710 V/m; Power Drift = 0.16 dB

Peak SAR (extrapolated) = 0.277 W/kg

SAR(1 g) = 0.183 W/kg; SAR(10 g) = 0.120 W/kg

Maximum value of SAR (measured) = 0.194 W/kg



Plot 16 GSM 1900 GPRS (4Txslots) Left Edge Middle (Distance 10mm)

Date: 4/13/2019

Communication System: UID 0, GPRS 4TX (0); Frequency: 1880 MHz; Duty Cycle: 1:2.07491

Medium parameters used: $f = 1880$ MHz; $\sigma = 1.489$ S/m; $\epsilon_r = 52.896$; $\rho = 1000$ kg/m³

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

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.70, 7.70, 7.70); Calibrated: 5/29/2018;

Electronics: DAE4 SN1291; Calibrated: 12/4/2018

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Left Edge Middle/Area Scan (51x181x1): Interpolated grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.199 W/kg

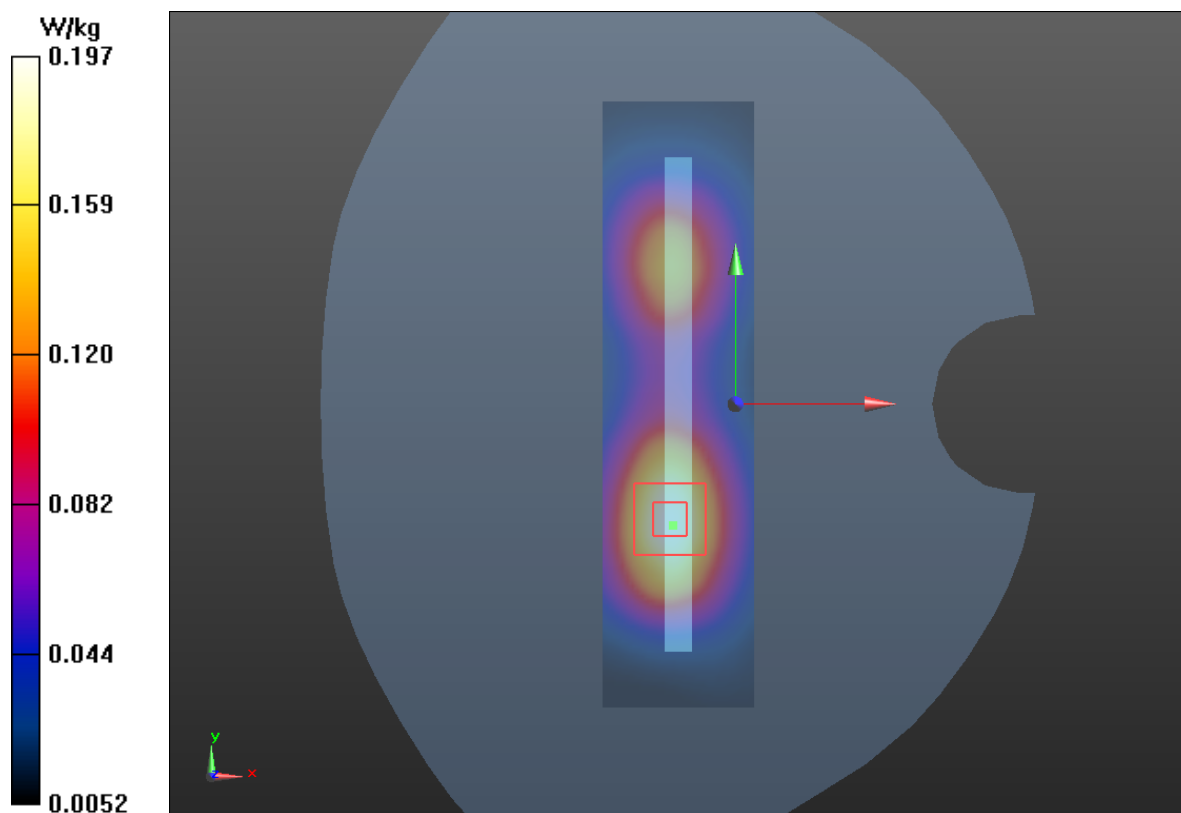
Left Edge Middle/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 7.395 V/m; Power Drift = 0.14 dB

Peak SAR (extrapolated) = 0.295 W/kg

SAR(1 g) = 0.182 W/kg; SAR(10 g) = 0.108 W/kg

Maximum value of SAR (measured) = 0.197 W/kg



Plot 17 UMTS Band V Left Cheek Middle

Date: 4/9/2019

Communication System: UID 0, WCDMA (0); Frequency: 836.6 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 836.6$ MHz; $\sigma = 0.916$ S/m; $\epsilon_r = 41.951$; $\rho = 1000$ kg/m³

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

Phantom section: Left Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(9.10, 9.10, 9.10); Calibrated: 5/29/2018;

Electronics: DAE4 SN1291; Calibrated: 12/4/2018

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Left Cheek Middle/Area Scan (71x121x1): Interpolated grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.415 W/kg

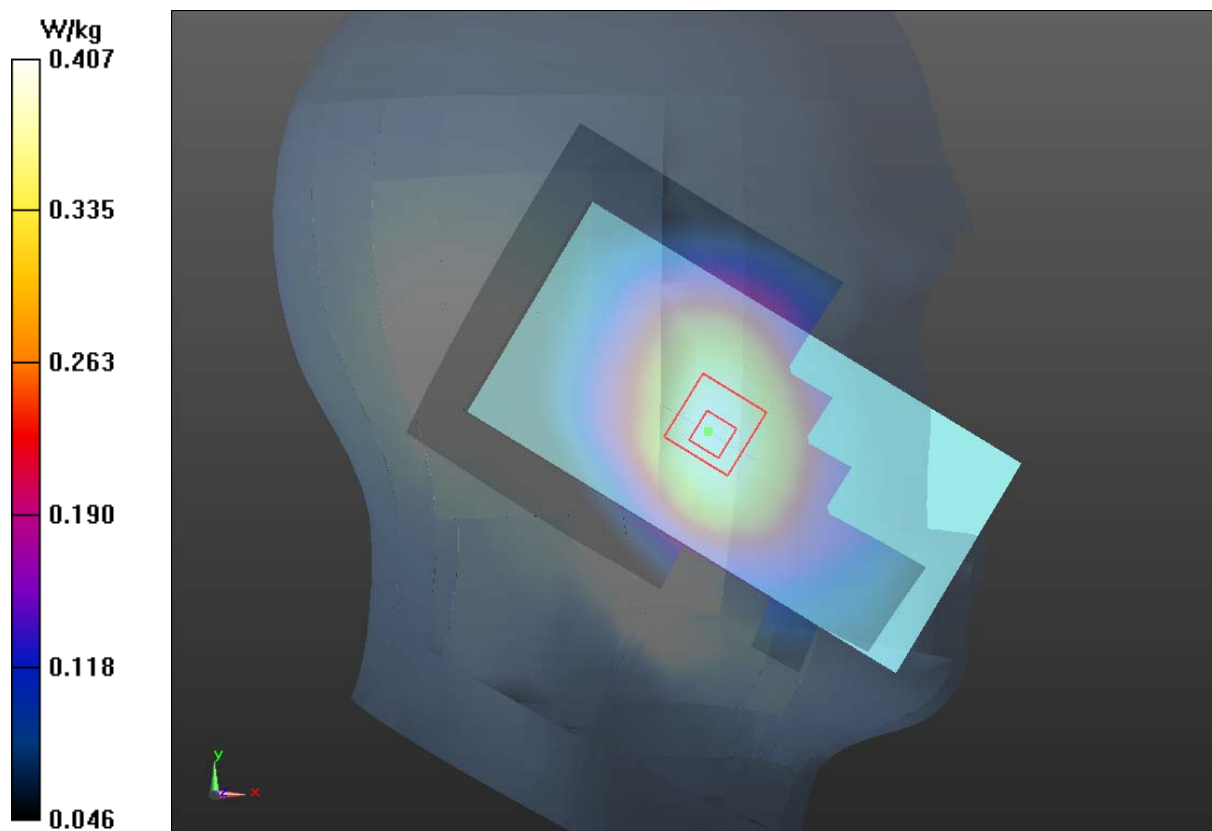
Left Cheek Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 7.179 V/m; Power Drift = 0.100 dB

Peak SAR (extrapolated) = 0.493 W/kg

SAR(1 g) = 0.387 W/kg; SAR(10 g) = 0.293 W/kg

Maximum value of SAR (measured) = 0.407 W/kg



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

Date: 4/11/2019

Communication System: UID 0, WCDMA (0); Frequency: 836.6 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 836.6$ MHz; $\sigma = 0.9733$ S/m; $\epsilon_r = 53.8047$; $\rho = 1000$ kg/m³

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

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(9.32, 9.32, 9.32); Calibrated: 5/29/2018;

Electronics: DAE4 SN1291; Calibrated: 12/4/2018

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Back Side Middle /Area Scan (71x121x1): Interpolated grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.485 W/kg

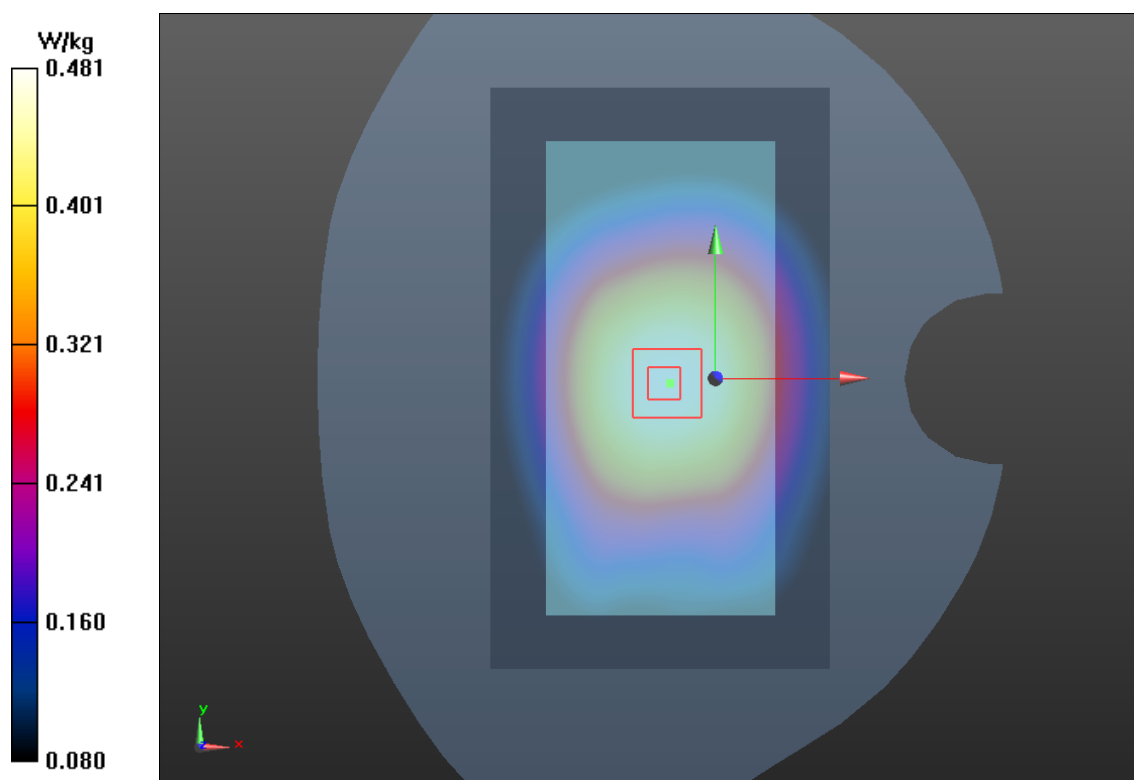
Back Side Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 24.31 V/m; Power Drift = -0.048 dB

Peak SAR (extrapolated) = 0.575 W/kg

SAR(1 g) = 0.459 W/kg; SAR(10 g) = 0.350 W/kg

Maximum value of SAR (measured) = 0.481 W/kg



Plot 19 UMTS Band V Back Side Middle (Distance 10mm)

Date: 4/11/2019

Communication System: UID 0, WCDMA (0); Frequency: 836.6 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 836.6$ MHz; $\sigma = 0.9733$ S/m; $\epsilon_r = 53.8047$; $\rho = 1000$ kg/m³

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

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(9.32, 9.32, 9.32); Calibrated: 5/29/2018;

Electronics: DAE4 SN1291; Calibrated: 12/4/2018

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Back Side Middle /Area Scan (71x121x1): Interpolated grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.550 W/kg

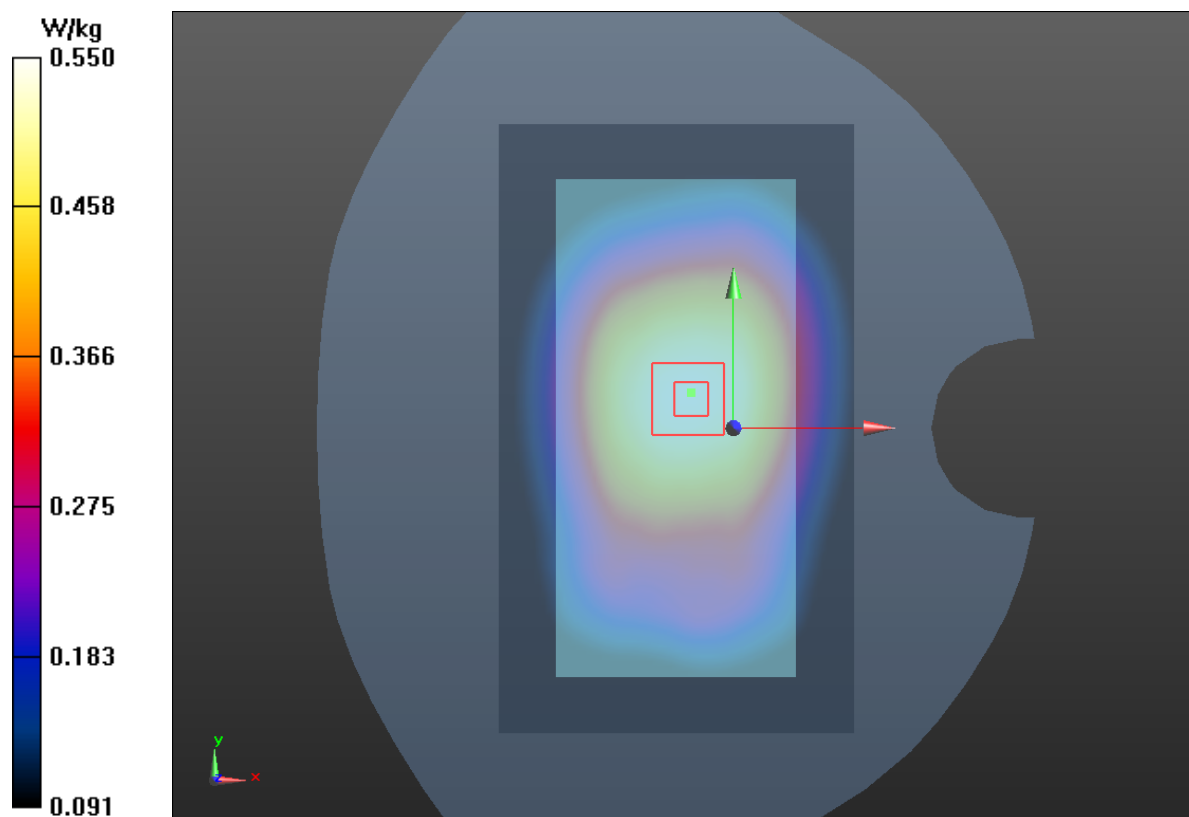
Back Side Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 24.24 V/m; Power Drift = 0.000 dB

Peak SAR (extrapolated) = 0.652 W/kg

SAR(1 g) = 0.526 W/kg; SAR(10 g) = 0.405 W/kg

Maximum value of SAR (measured) = 0.550 W/kg



Plot 20 LTE Band 5 1RB (25 RB Offset) Right Cheek Middle

Date: 4/9/2019

Communication System: UID 0, LTE (0); Frequency: 836.5 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 836.5$ MHz; $\sigma = 0.916$ S/m; $\epsilon_r = 41.958$; $\rho = 1000$ kg/m³

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

Phantom section: Right Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(9.10, 9.10, 9.10); Calibrated: 5/29/2018;

Electronics: DAE4 SN1291; Calibrated: 12/4/2018

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Right Cheek Middle/Area Scan (71x121x1): Interpolated grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.327 W/kg

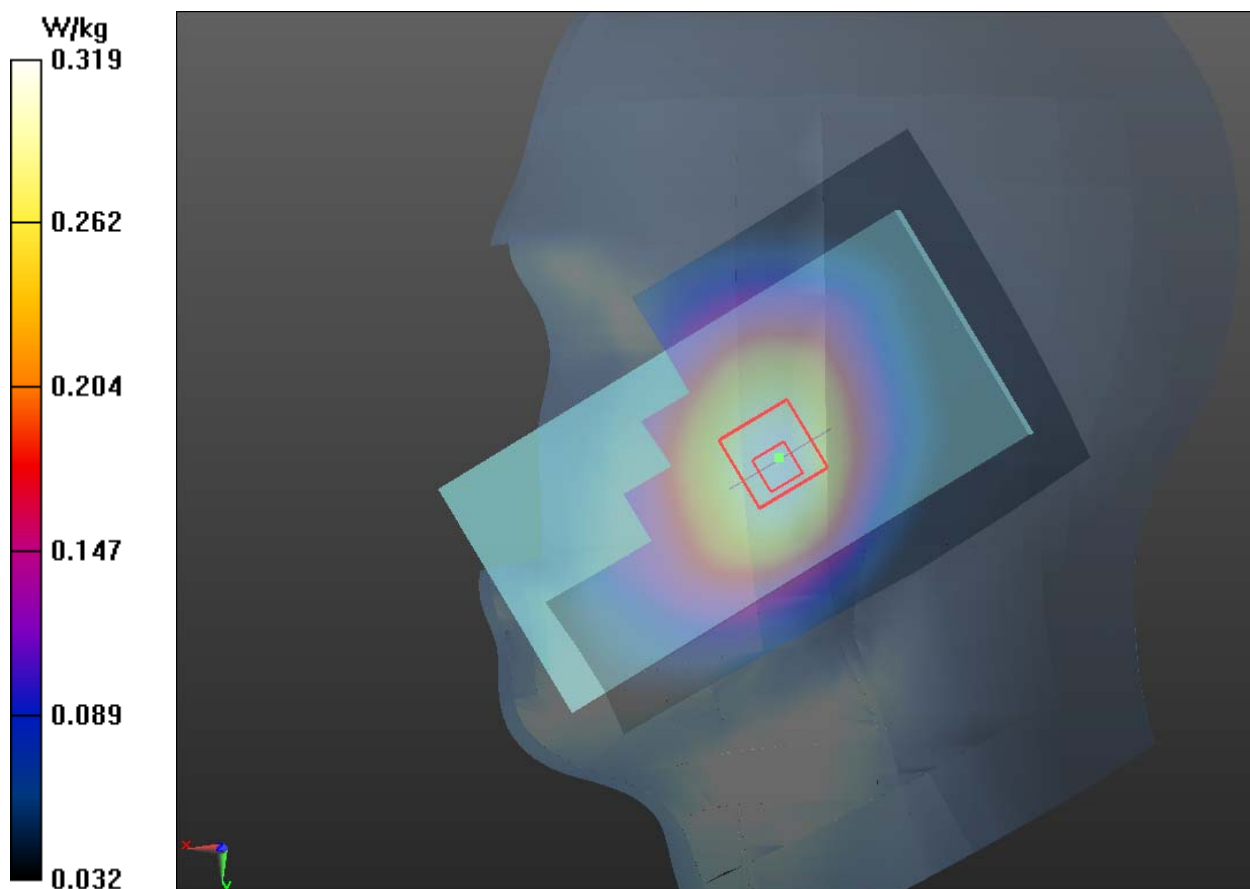
Right Cheek Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 5.227 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 0.390 W/kg

SAR(1 g) = 0.304 W/kg; SAR(10 g) = 0.228 W/kg

Maximum value of SAR (measured) = 0.319 W/kg



Plot 21 LTE Band 5 1RB (25 RB Offset) Back Side Middle(Battery2, Distance 15mm)

Date: 4/11/2019

Communication System: UID 0, LTE (0); Frequency: 836.5 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 836.5$ MHz; $\sigma = 0.974$ S/m; $\epsilon_r = 53.797$; $\rho = 1000$ kg/m³

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

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(9.32, 9.32, 9.32); Calibrated: 5/29/2018;

Electronics: DAE4 SN1291; Calibrated: 12/4/2018

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Back Side Middle /Area Scan (71x121x1): Interpolated grid: dx=15 mm, dy=15 mm

Maximum value of SAR (interpolated) = 0.580 W/kg

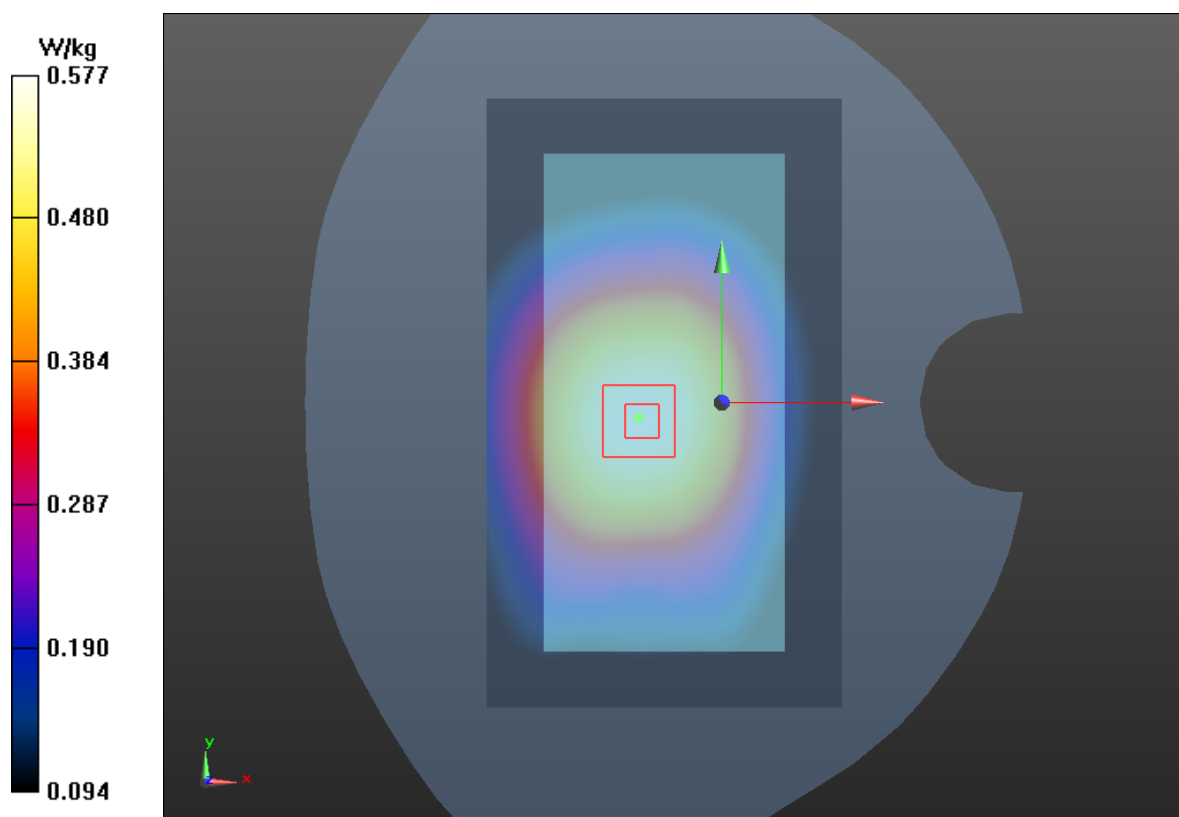
Back Side Middle /Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 24.63 V/m; Power Drift = -0.060 dB

Peak SAR (extrapolated) = 0.679 W/kg

SAR(1 g) = 0.550 W/kg; SAR(10 g) = 0.420 W/kg

Maximum value of SAR (measured) = 0.577 W/kg



Plot 22 LTE Band 5 1RB (25 RB Offset) Back Side Middle (Battery2, Distance 10mm)

Date: 4/11/2019

Communication System: UID 0, LTE (0); Frequency: 836.5 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 836.5$ MHz; $\sigma = 0.974$ S/m; $\epsilon_r = 53.797$; $\rho = 1000$ kg/m³

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

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(9.32, 9.32, 9.32); Calibrated: 5/29/2018;

Electronics: DAE4 SN1291; Calibrated: 12/4/2018

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Back Side Middle /Area Scan (71x121x1): Interpolated grid: dx=15 mm, dy=15 mm

Maximum value of SAR (interpolated) = 0.642 W/kg

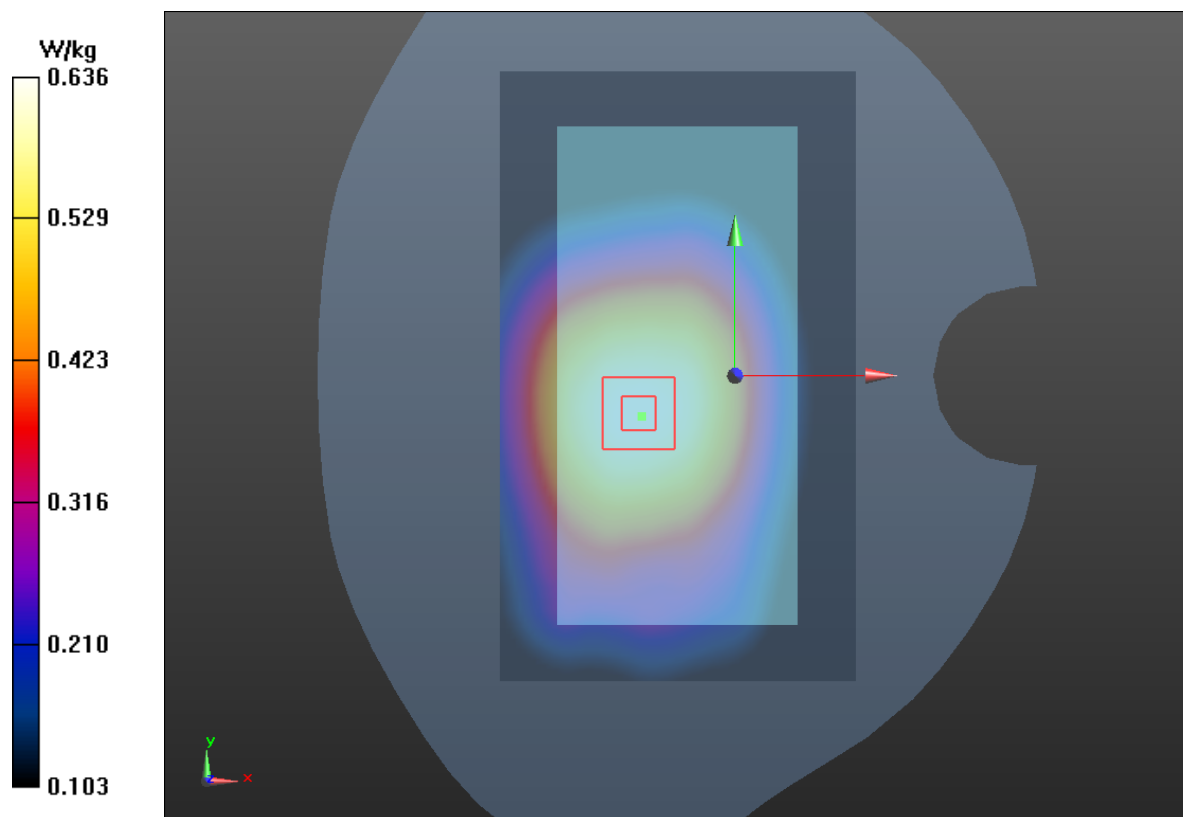
Back Side Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 25.28 V/m; Power Drift = 0.010 dB

Peak SAR (extrapolated) = 0.747 W/kg

SAR(1 g) = 0.609 W/kg; SAR(10 g) = 0.470 W/kg

Maximum value of SAR (measured) = 0.636 W/kg



Plot 23 LTE Band 7 1RB (50 RB Offset) Right Cheek Middle

Date: 4/9/2019

Communication System: UID 0, LTE (0); Frequency: 2535 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 2535$ MHz; $\sigma = 1.948$ S/m; $\epsilon_r = 38.395$; $\rho = 1000$ kg/m³

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

Phantom section: Right Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.28, 7.28, 7.28); Calibrated: 5/29/2018;

Electronics: DAE4 SN1291; Calibrated: 12/4/2018

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Right Cheek Middle/Area Scan (91x151x1): Interpolated grid: dx=12 mm, dy=12 mm

Maximum value of SAR (interpolated) = 0.208 W/kg

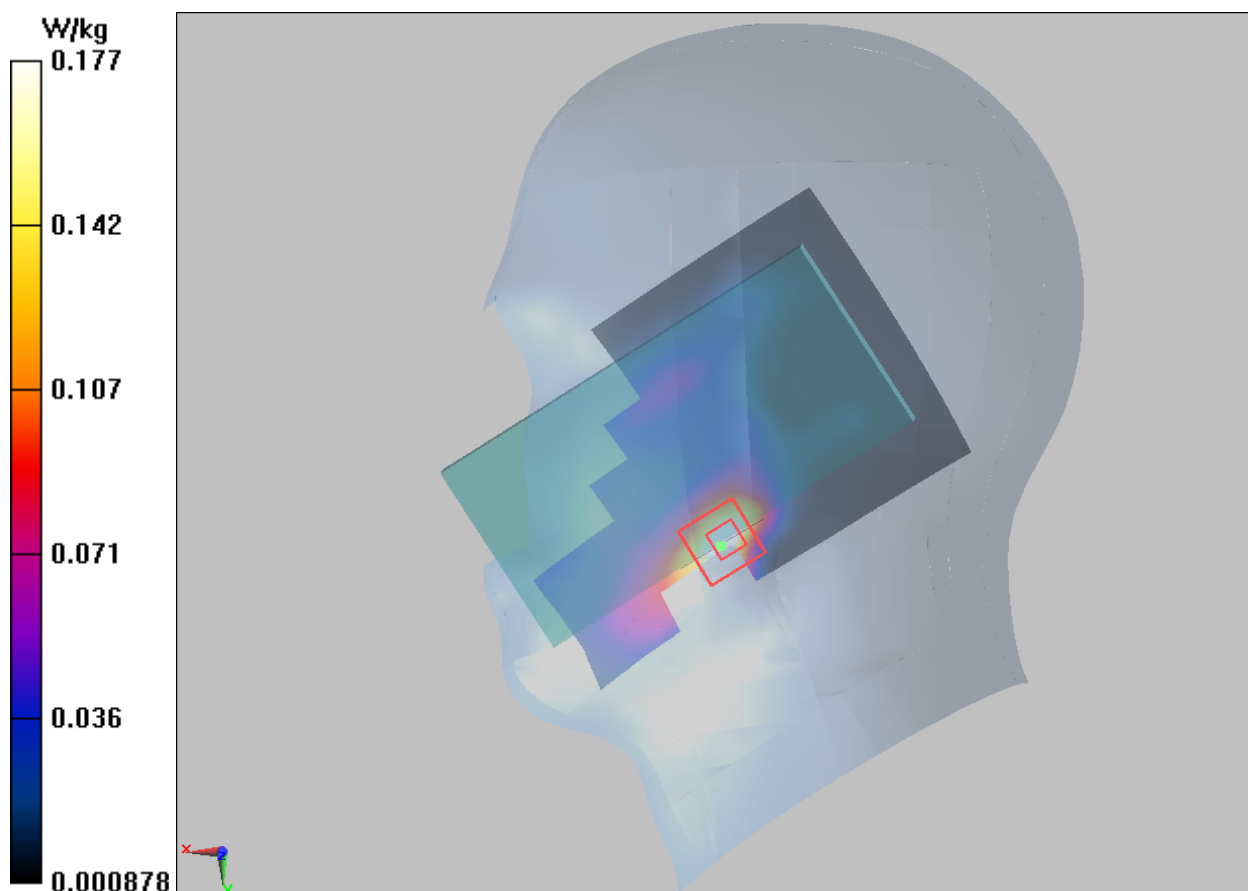
Right Cheek Middle/Zoom Scan(7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 1.214 V/m; Power Drift = 0.086 dB

Peak SAR (extrapolated) = 0.312 W/kg

SAR(1 g) = 0.162 W/kg; SAR(10 g) = 0.081 W/kg

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



Plot 24 LTE Band 7 50%RB (25 RB Offset) Back Side Low (Distance 15mm)

Date: 4/9/2019

Communication System: UID 0, LTE (0); Frequency: 2510 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 2510$ MHz; $\sigma = 2.045$ S/m; $\epsilon_r = 50.913$; $\rho = 1000$ kg/m³

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

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.16, 7.16, 7.16); Calibrated: 5/29/2018;

Electronics: DAE4 SN1291; Calibrated: 12/4/2018

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Back Side Low/Area Scan (91x151x1): Interpolated grid: dx=12 mm, dy=12 mm

Maximum value of SAR (interpolated) = 0.409 W/kg

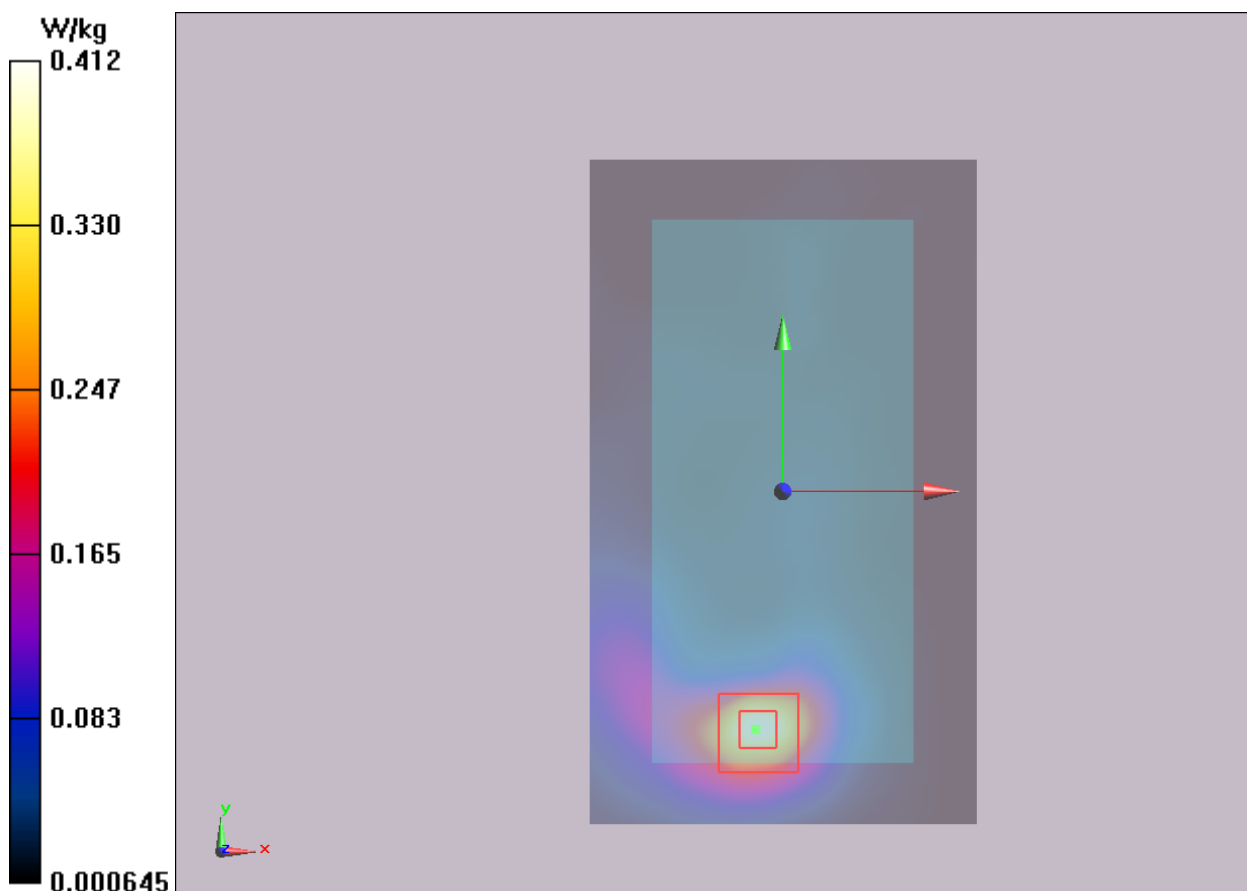
Back Side Low/Zoom Scan(7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 3.082 V/m; Power Drift = 0.084 dB

Peak SAR (extrapolated) = 0.715 W/kg

SAR(1 g) = 0.363 W/kg; SAR(10 g) = 0.174 W/kg

Maximum value of SAR (measured) = 0.412 W/kg



Plot 25 LTE Band 7 50%RB (50 RB Offset) Bottom Edge Middle(Distance 10mm)

Date: 4/9/2019

Communication System: UID 0, LTE (0); Frequency: 2535 MHz;Duty Cycle: 1:1

Medium parameters used: $f = 2535$ MHz; $\sigma = 2.075$ S/m; $\epsilon_r = 50.843$; $\rho = 1000$ kg/m³

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

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.16, 7.16, 7.16); Calibrated: 5/29/2018;

Electronics: DAE4 SN1291; Calibrated: 12/4/2018

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Bottom Edge Middle/Area Scan (51x111x1): Interpolated grid: dx=10 mm, dy=10 mm

Maximum value of SAR (interpolated) = 0.590 W/kg

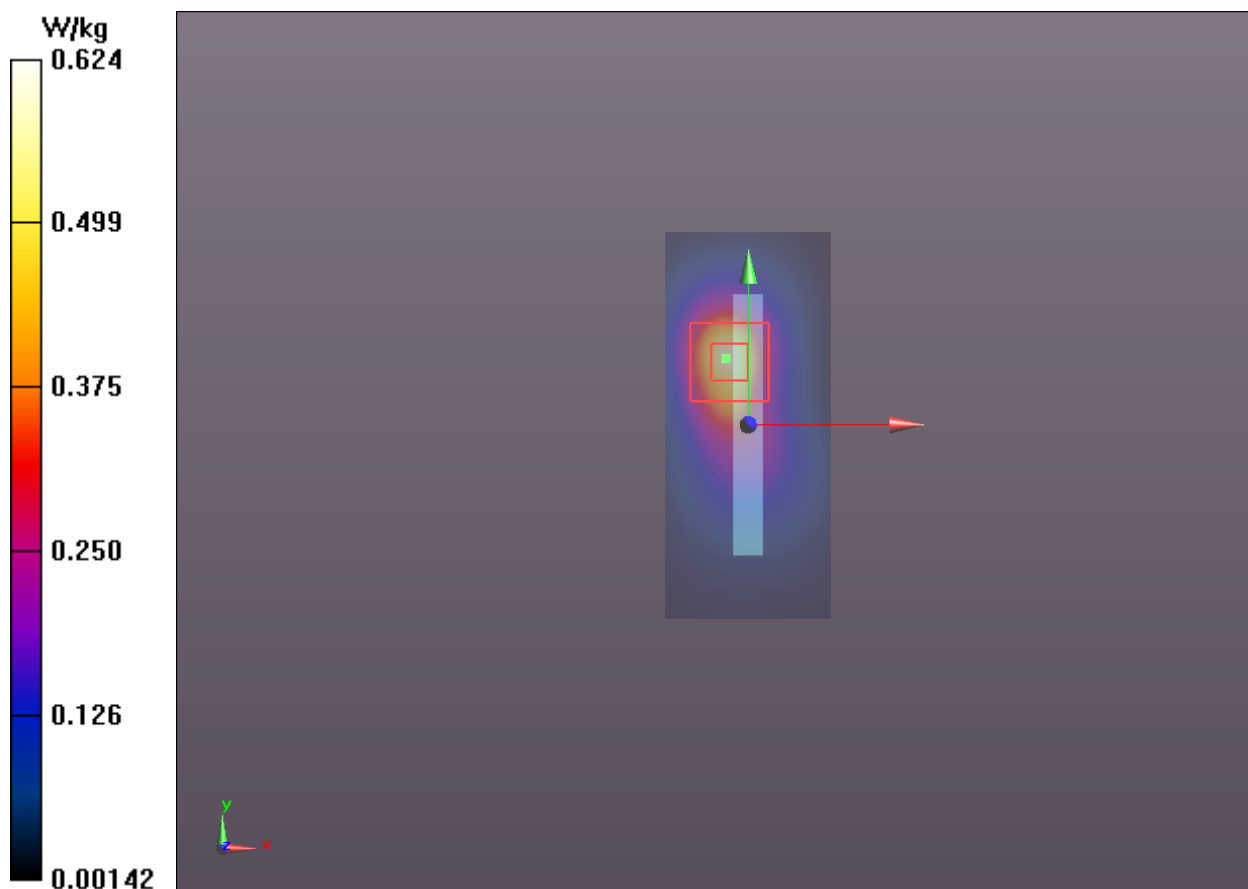
Bottom Edge Middle/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 12.24 V/m; Power Drift = 0.029 dB

Peak SAR (extrapolated) = 1.15 W/kg

SAR(1 g) = 0.543 W/kg; SAR(10 g) = 0.243 W/kg

Maximum value of SAR (measured) = 0.624 W/kg



Plot 26 802.11b Left Cheek Low(Battery3)

Date: 4/13/2019

Communication System: UID 0, 802.11b (0); Frequency: 2412 MHz; Duty Cycle: 1:1.0101

Medium parameters used: $f = 2412$ MHz; $\sigma = 1.817$ S/m; $\epsilon_r = 38.843$; $\rho = 1000$ kg/m³

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

Phantom section: Left Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.57, 7.57, 7.57); Calibrated: 5/29/2018;

Electronics: DAE4 SN1291; Calibrated: 12/4/2018

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Left Cheek Low/Area Scan (91x151x1): Interpolated grid: dx=12 mm, dy=12 mm

Maximum value of SAR (interpolated) = 0.306 W/kg

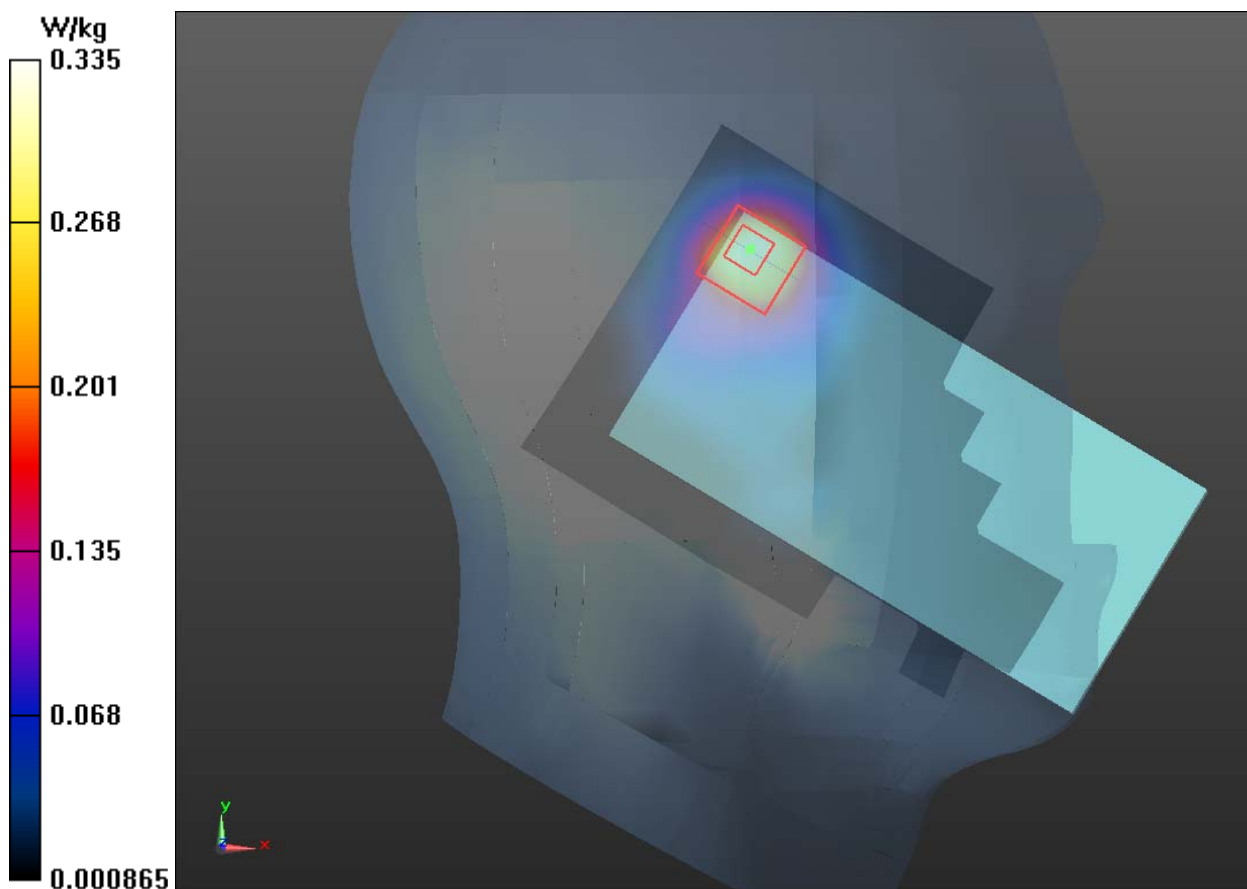
Left Cheek Low/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 7.278 V/m; Power Drift = 0.020 dB

Peak SAR (extrapolated) = 0.705 W/kg

SAR(1 g) = 0.299 W/kg; SAR(10 g) = 0.136 W/kg

Maximum value of SAR (measured) = 0.335 W/kg



Plot 27 802.11b Back Side Low (Distance 15mm)

Date: 4/13/2019

Communication System: UID 0, 802.11b (0); Frequency: 2412 MHz; Duty Cycle: 1:1.0101

Medium parameters used: $f = 2412$ MHz; $\sigma = 1.929$ S/m; $\epsilon_r = 51.204$; $\rho = 1000$ kg/m³

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

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.53, 7.53, 7.53); Calibrated: 5/29/2018;

Electronics: DAE4 SN1291; Calibrated: 12/4/2018

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Back Side Low/Area Scan (91x151x1): Interpolated grid: dx=12 mm, dy=12 mm

Maximum value of SAR (interpolated) = 0.100 W/kg

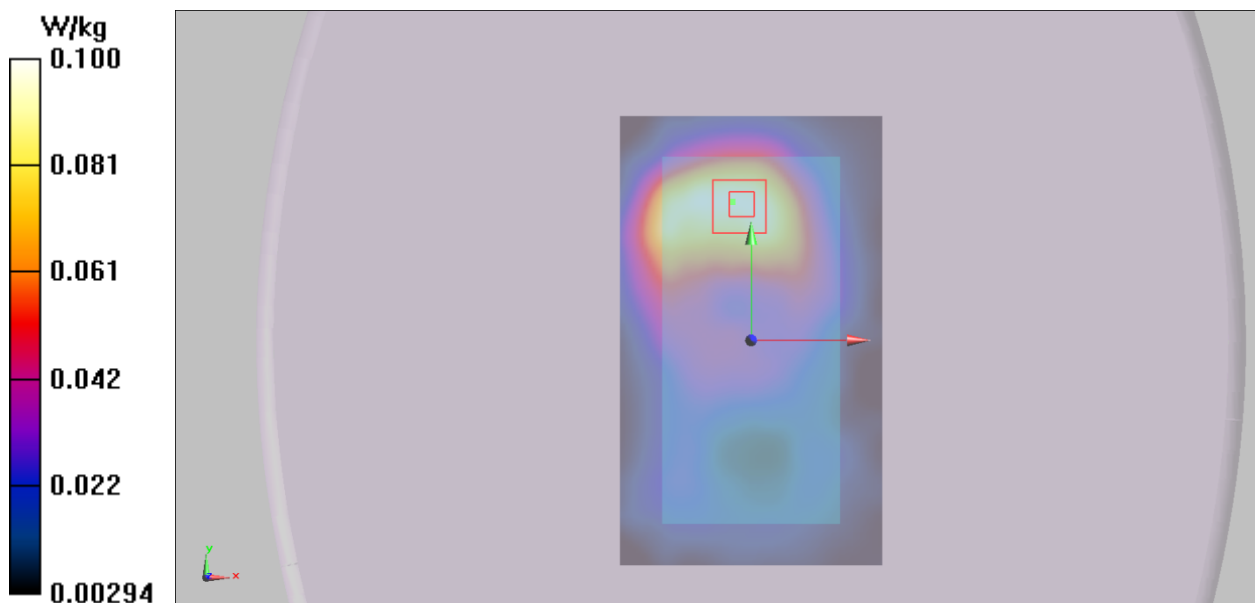
Back Side Low/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 4.325 V/m; Power Drift = 0.048 dB

Peak SAR (extrapolated) = 0.177 W/kg

SAR(1 g) = 0.094 W/kg; SAR(10 g) = 0.056 W/kg

Maximum value of SAR (measured) = 0.100 W/kg



Plot 28 802.11b Back Side Low (Distance 10mm)

Date: 4/13/2019

Communication System: UID 0, 802.11b (0); Frequency: 2412 MHz; Duty Cycle: 1:1.0101

Medium parameters used: $f = 2412$ MHz; $\sigma = 1.929$ S/m; $\epsilon_r = 51.204$; $\rho = 1000$ kg/m³

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

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.53, 7.53, 7.53); Calibrated: 5/29/2018;

Electronics: DAE4 SN1291; Calibrated: 12/4/2018

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Back Side Low /Area Scan (91x151x1): Interpolated grid: dx=12 mm, dy=12 mm

Maximum value of SAR (interpolated) = 0.225 W/kg

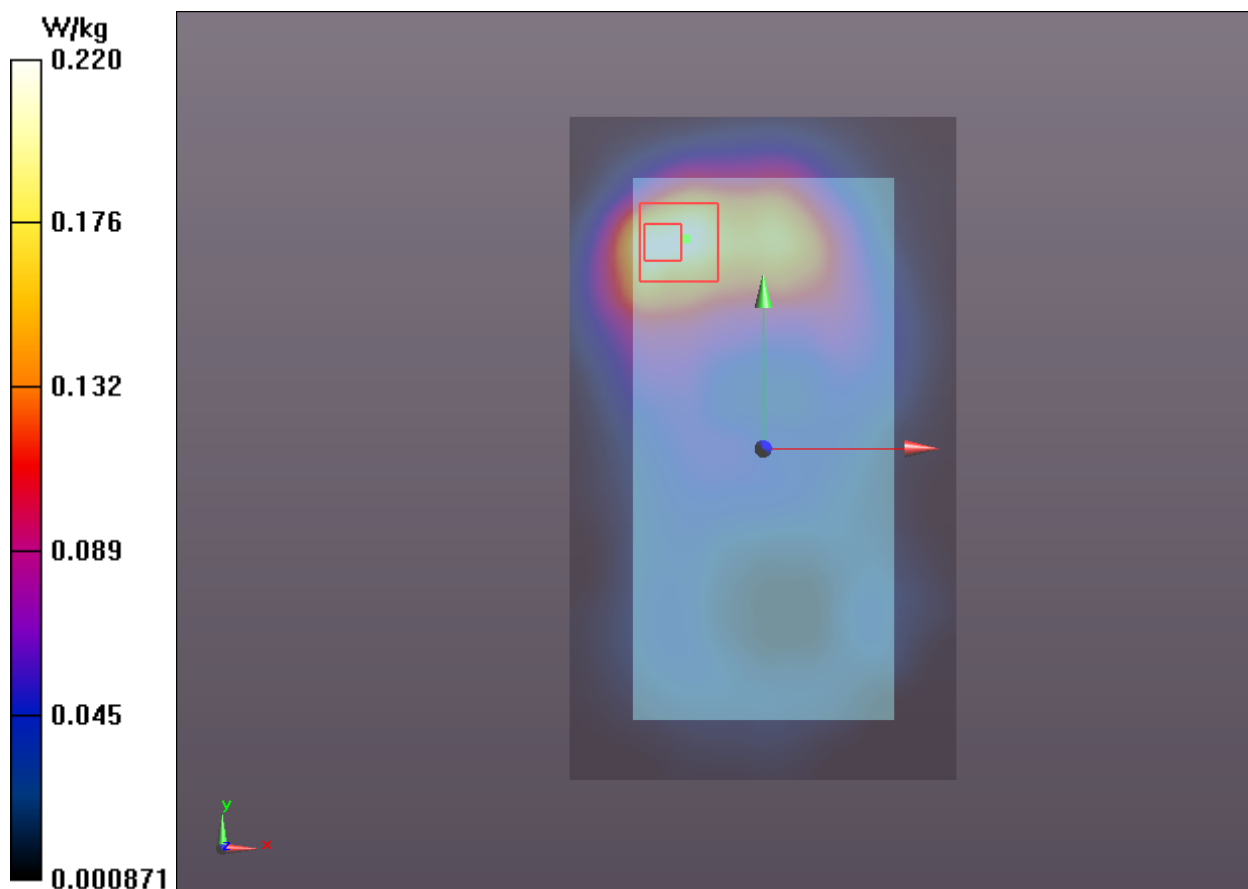
Back Side Low/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 4.941 V/m; Power Drift = 0.041 dB

Peak SAR (extrapolated) = 0.419 W/kg

SAR(1 g) = 0.201 W/kg; SAR(10 g) = 0.104 W/kg

Maximum value of SAR (measured) = 0.220 W/kg



Plot 29 BT Left Cheek Low

Date: 4/13/2019

Communication System: UID 0, BT (0); Frequency: 2402 MHz; Duty Cycle: 1:2.1645

Medium parameters used: $f = 2402$ MHz; $\sigma = 1.806$ S/m; $\epsilon_r = 38.877$; $\rho = 1000$ kg/m³

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

Phantom section: Left Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.57, 7.57, 7.57); Calibrated: 5/29/2018;

Electronics: DAE4 SN1291; Calibrated: 12/4/2018

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Left Cheek Low /Area Scan (91x151x1): Interpolated grid: dx=12 mm, dy=12 mm

Maximum value of SAR (interpolated) = 0.119 W/kg

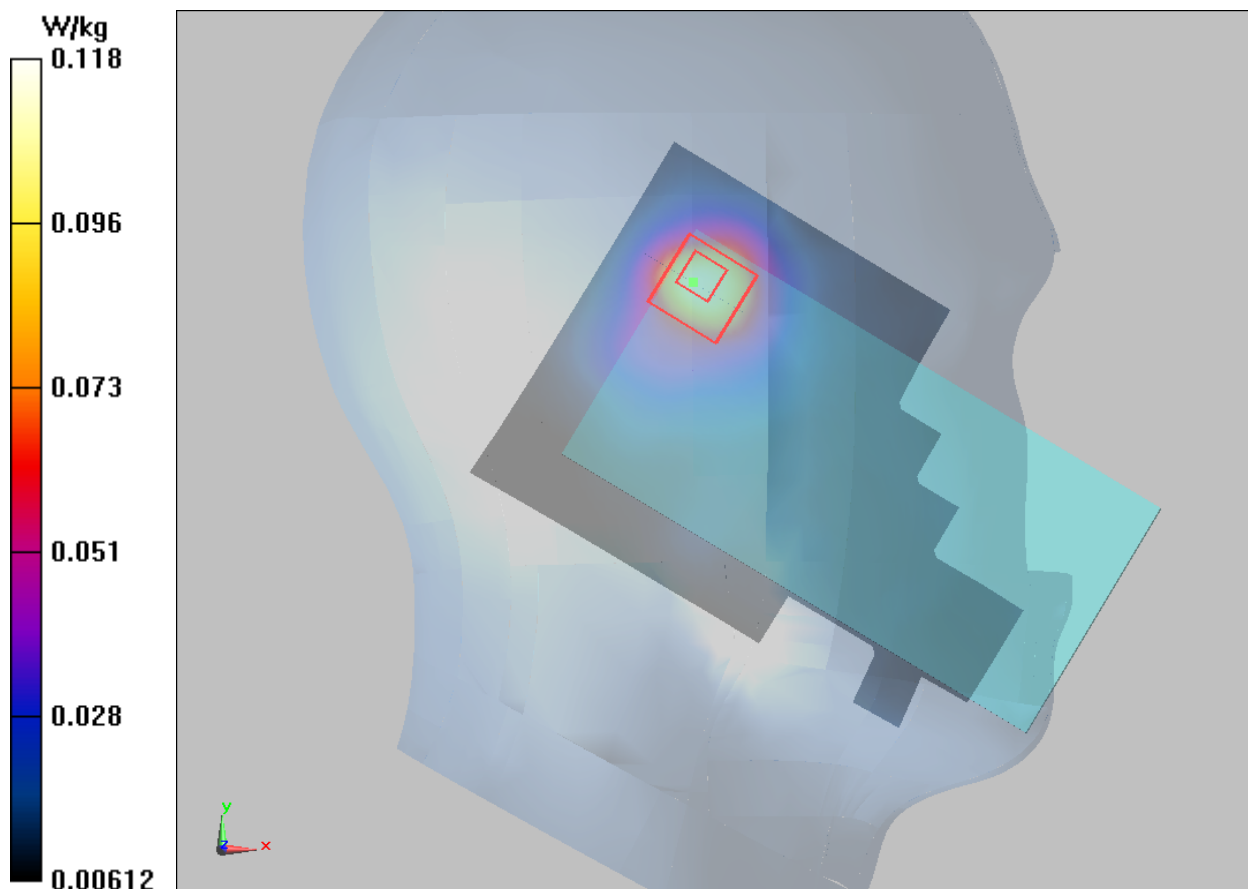
Left Cheek Low/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 4.521 V/m; Power Drift = 0.068 dB

Peak SAR (extrapolated) = 0.288 W/kg

SAR(1 g) = 0.111 W/kg; SAR(10 g) = 0.054 W/kg

Maximum value of SAR (measured) = 0.118 W/kg





ANNEX D: Probe Calibration Certificate



In Collaboration with
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CALIBRATION LABORATORY



中国认可
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CNAS L0570

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Client **TA(shanghai)**Certificate No: **Z18-60093****CALIBRATION CERTIFICATE**Object **EX3DV4 - SN:3677**

Calibration Procedure(s) **FF-Z11-004-01**
Calibration Procedures for Dosimetric E-field Probes

Calibration date: **May 29, 2018**

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	101919	27-Jun-17 (CTTL, No.J17X05857)	Jun-18
Power sensor NRP-Z91	101547	27-Jun-17 (CTTL, No.J17X05857)	Jun-18
Power sensor NRP-Z91	101548	27-Jun-17 (CTTL, No.J17X05857)	Jun-18
Reference10dBAttenuator	18N50W-10dB	09-Feb-18(CTTL, No.J18X01133)	Feb-20
Reference20dBAttenuator	18N50W-20dB	09-Feb-18(CTTL, No.J18X01132)	Feb-20
Reference Probe EX3DV4	SN 3846	25-Jan-18(SPEAG, No.EX3-3846_Jan18)	Jan-19
DAE4	SN 777	15-Dec-17(SPEAG, No.DAE4-777_Dec17)	Dec -18
Secondary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
SignalGeneratorMG3700A	6201052605	27-Jun-17 (CTTL, No.J17X05858)	Jun-18
Network Analyzer E5071C	MY46110673	14-Jan-18 (CTTL, No.J18X00561)	Jan -19

	Name	Function	Signature
Calibrated by:	Yu Zongying	SAR Test Engineer	
Reviewed by:	Lin Hao	SAR Test Engineer	
Approved by:	Qi Dianyuan	SAR Project Leader	

Issued: May 31, 2018

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Certificate No: Z18-60093

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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), $\theta=0$ is normal to probe axis

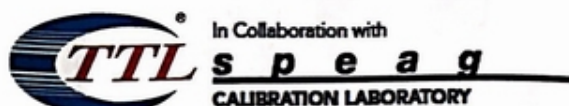
Connector Angle information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

- 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
- 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
- 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
- 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 $\theta=0$ ($f \leq 900\text{MHz}$ in TEM-cell; $f > 1800\text{MHz}$: waveguide). NORM_{x,y,z} are only intermediate values, i.e., the uncertainties of NORM_{x,y,z} does not effect the E^2 -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.
- DCPx,y,z:** DCP are numerical linearization parameters assessed based on the data of power sweep (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}; VR_{x,y,z}:** A,B,C 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 $f \leq 800\text{MHz}$) and inside waveguide using analytical field distributions based on power measurements for $f > 800\text{MHz}$. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty valued 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 $\pm 50\text{MHz}$ to $\pm 100\text{MHz}$.
- 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).



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Probe EX3DV4

SN: 3677

Calibrated: May 29, 2018

Calibrated for DASY/EASY Systems

(Note: non-compatible with DASY2 system!)

Certificate No: Z18-60093

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DASY/EASY – Parameters of Probe: EX3DV4 – SN: 3677

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm($\mu\text{V}/(\text{V/m})^2$) ^A	0.41	0.46	0.41	±10.0%
DCP(mV) ^B	99.9	102.7	102.1	

Modulation Calibration Parameters

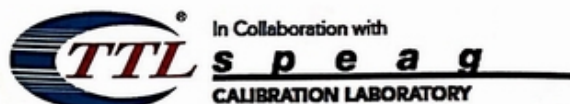
UID	Communication System Name		A dB	B dB $\sqrt{\mu\text{V}}$	C	D dB	VR mV	Unc ^E (k=2)
0	CW	X	0.0	0.0	1.0	0.00	152.4	±2.4%
		Y	0.0	0.0	1.0		161.7	
		Z	0.0	0.0	1.0		152.2	

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 Page 5 and Page 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.



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DASY/EASY – Parameters of Probe: EX3DV4 – SN: 3677

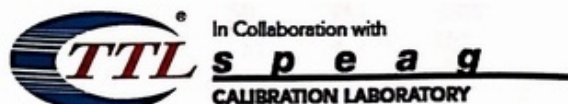
Calibration Parameter Determined in Head Tissue Simulating Media

f [MHz] ^C	Relative Permittivity ^F	Conductivity (S/m) ^F	ConvF X	ConvF Y	ConvF Z	Alpha ^G	Depth ^G (mm)	Unct. (k=2)
750	41.9	0.89	9.40	9.40	9.40	0.40	0.80	± 12.1%
835	41.5	0.90	9.10	9.10	9.10	0.15	1.41	± 12.1%
1750	40.1	1.37	8.19	8.19	8.19	0.21	1.15	± 12.1%
1900	40.0	1.40	7.96	7.96	7.96	0.25	1.01	± 12.1%
2300	39.5	1.67	7.91	7.91	7.91	0.40	0.78	± 12.1%
2450	39.2	1.80	7.57	7.57	7.57	0.53	0.76	± 12.1%
2600	39.0	1.96	7.28	7.28	7.28	0.64	0.70	± 12.1%
5250	35.9	4.71	5.60	5.60	5.60	0.40	1.15	± 13.3%
5600	35.5	5.07	4.87	4.87	4.87	0.45	1.05	± 13.3%
5750	35.4	5.22	4.99	4.99	4.99	0.45	1.35	± 13.3%

^C Frequency validity above 300 MHz of ±100MHz only applies for DASY v4.4 and higher (Page 2), else it is restricted to ±50MHz. The uncertainty is the RSS of 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. Above 5 GHz frequency validity can be extended to ± 110 MHz.

^F At frequency 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 the frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.



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DASY/EASY – Parameters of Probe: EX3DV4 – SN: 3677

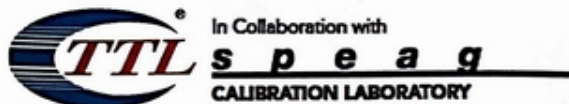
Calibration Parameter Determined in Body Tissue Simulating Media

f [MHz] ^C	Relative Permittivity ^F	Conductivity (S/m) ^F	ConvF X	ConvF Y	ConvF Z	Alpha ^G	Depth ^G (mm)	Unct. (k=2)
750	55.5	0.96	9.79	9.79	9.79	0.40	0.80	±12.1%
835	55.2	0.97	9.32	9.32	9.32	0.15	1.51	±12.1%
1750	53.4	1.49	7.91	7.91	7.91	0.23	1.09	±12.1%
1900	53.3	1.52	7.70	7.70	7.70	0.20	1.18	±12.1%
2300	52.9	1.81	7.65	7.65	7.65	0.53	0.82	±12.1%
2450	52.7	1.95	7.53	7.53	7.53	0.37	1.10	±12.1%
2600	52.5	2.16	7.16	7.16	7.16	0.55	0.80	±12.1%
5250	48.9	5.36	5.04	5.04	5.04	0.50	1.55	±13.3%
5600	48.5	5.77	4.27	4.27	4.27	0.51	1.66	±13.3%
5750	48.3	5.94	4.43	4.43	4.43	0.50	1.81	±13.3%

^C Frequency validity above 300 MHz of ±100MHz only applies for DASY v4.4 and higher (Page 2), else it is restricted to ±50MHz. The uncertainty is the RSS of 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. Above 5 GHz frequency validity can be extended to ± 110 MHz.

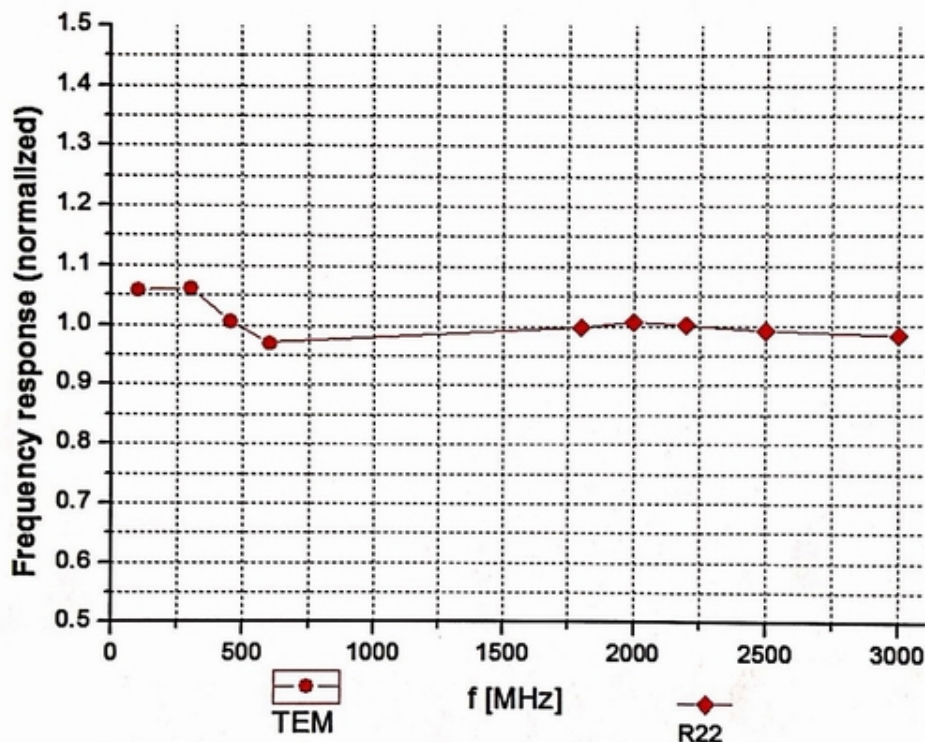
^F At frequency below 3 GHz, the validity of tissue parameters (ϵ and σ) can be relaxed to ±10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ϵ and σ) is restricted to ±5%. The uncertainty is the RSS of the ConvF uncertainty 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 the frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.



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Frequency Response of E-Field (TEM-Cell: ifi110 EXX, Waveguide: R22)



Uncertainty of Frequency Response of E-field: $\pm 7.4\%$ (k=2)