



TEST REPORT

No. I23N01648-SAR

For

TCL Communication Ltd.

LTE/WCDMA/GSM mobile phone

Model Name: T311E

With

Hardware Version: V00

Software Version: T311E_OFCO_2SIM_V1.0_20230922_UNLOCK

FCC ID: 2ACCJB196

Issued Date: 2023-10-23

Designation Number: CN1210

Note:

The test results in this test report relate only to the devices specified in this report. This report shall not be reproduced except in full without the written approval of SAICT.

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REPORT HISTORY

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1. Summary of Test Report

1.1. Test Items

Description: LTE/WCDMA/GSM mobile phone
Model Name: T311E
Applicant's Name: TCL Communication Ltd.
Manufacturer's Name: TCL Communication Ltd.

1.2. Test Standards

ANSI C95.1:1992, IEEE 1528:2013

1.3. Test Result

Pass. Please refer to "13. Summary of Test Results" and "ANNEX K: Spot Check Test"

1.4. Testing Location

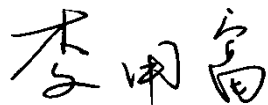
Address: Building G, Shenzhen International Innovation Center, No.1006 Shennan Road, Futian District, Shenzhen, Guangdong, P. R. China

1.5. Project Data

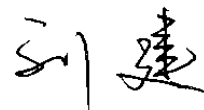
Testing Start Date: 2022-12-17

Testing End Date: 2023-10-12

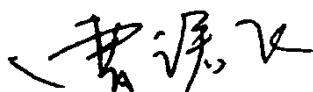
1.6. Signature



Li Yongfu
(Prepared this test report)



Liu Jian
(Reviewed this test report)



Cao Junfei
(Approved this test report)

2. Statement of Compliance

This EUT is a variant product and the report of original sample is No. I22N02497-SAR. According to “Justification Letter” provided by applicant, we quote the test results of original sample and spot check the worst case in annex K.

The maximum results of Specific Absorption Rate (SAR) found during testing for TCL Communication Ltd. LTE/WCDMA/GSM mobile phone T311E are as follows:

Table 2.1: Highest Reported SAR (1g)

Equipment Class	Frequency Bands	1g SAR (W/kg)	
		Head (Separation Distance 0mm)	Body-worn (Separation Distance 15mm)
PCE	GSM 850	1.29	0.76
	GSM 1900	0.46	0.26
	WCDMA Band 2	0.59	0.43
	WCDMA Band 4	0.68	0.10
	WCDMA Band 5	0.95	0.77
	LTE Band 2	0.19	0.34
	LTE Band 4	1.14	1.12
	LTE Band 5	1.24	1.02
	LTE Band 7	0.56	0.30
	LTE Band 13	0.47	0.44
DSS	Bluetooth	0.05	<0.01

The SAR values found for the Mobile Phone are below the maximum recommended levels of 1.6 W/Kg as averaged over any 1g tissue according to the ANSI C95.1-1992.

The measurement together with the test system set-up is described in annex C of this test report. A detailed description of the equipment under test can be found in chapter 4 of this test report.

The highest reported SAR value is obtained at the case of (**Table 2.1**), Head value is **1.29 W/kg (1g)** and Body-worn value is **1.12 W/kg (1g)**.

Table 2.2: Maximum Simultaneous Transmission SAR

/	Position	Sum (W/kg)
Highest reported SAR value for Head	Left Cheek (GSM850 + Bluetooth)	1.34
Highest reported SAR value for Body-worn	Rear Side (LTE Band 4 + Bluetooth)	1.12

Note: the test positions of above tables are for the worse case that has been evaluated.

According to the above tables, the highest sum of reported SAR values is **1.34 W/kg (1g)**.

The detail for simultaneous transmission consideration is described in chapter 12.



3. Client Information

3.1. Applicant Information

Company Name:	TCL Communication Ltd.
Address:	5/F, Building 22E, 22 Science Park East Avenue, Hong Kong Science Park, Shatin, NT, Hong Kong, China
City:	Hong Kong
Country:	China
Telephone:	+86 755 3661 1621

3.2. Manufacturer Information

Company Name:	TCL Communication Ltd.
Address:	5/F, Building 22E, 22 Science Park East Avenue, Hong Kong Science Park, Shatin, NT, Hong Kong, China
City:	Hong Kong
Country:	China
Telephone:	+86 755 3661 1621

4. Equipment under Test (EUT) and Ancillary Equipment (AE)

4.1. About EUT

Description:	LTE/WCDMA/GSM mobile phone
Model Name:	T311E
Condition of EUT as received:	No obvious damage in appearance
Frequency Bands:	GSM 850/1900, WCDMA Band 2/4/5, LTE Band 2/4/5/7/13, Bluetooth
Tested Tx Frequency:	824 – 849MHz (GSM 850)
	1850 – 1910MHz (GSM 1900)
	1850 – 1910MHz (WCDMA Band 2)
	1710 – 1755MHz (WCDMA Band 4)
	824 – 849MHz (WCDMA Band 5)
	1850 – 1910MHz (LTE Band 2)
	1700 – 1755MHz (LTE Band 4)
	824 – 849MHz (LTE Band 5)
	2500 – 2570MHz (LTE Band 7)
	777 – 787MHz (LTE Band 13)
2402 – 2480MHz (Bluetooth)	
GPRS Multislot Class:	12
GPRS capability Class:	B
Test device Production information:	Production unit
Device type:	Portable device
Antenna type:	Integrated antenna
Hotspot mode:	Not Support
Product Dimensions:	Long 114.8mm;Wide 48.12mm;Overall Diagonal 118.4mm
Remark: This device does not support DTM operation.	

4.2. Internal Identification of EUT used during the test

EUT ID*	IMEI	HW Version	SW Version	Receipt Date
UT01aa	353167580000560	V00	T311A_OFCO_1SIM_V1.0_20221208_UNLOCK	2022-12-12
UT02aa	353167580000545	V00	T311A_OFCO_1SIM_V1.0_20221208_UNLOCK	2022-12-12
UT09aa	353167580000644	V00	T311A_OFCO_1SIM_V1.0_20221208_UNLOCK	2022-12-15
UT10aa	353167580000651	V00	T311A_OFCO_1SIM_V1.0_20221208_UNLOCK	2022-12-15
UT02aa	359467780007116	V00	T311E_OFCO_2SIM_V1.0_20230922_UNLOCK	2023-10-09

*EUT ID: is used to identify the test sample in the lab internally.

Note: It is performed to test SAR with the UT02aa & UT09aa & UT10aa & UT02aa, and conducted power with the UT01aa.

4.3. Internal Identification of AE used during the test

AE ID*	Description	Model	Manufacturer
AE1	Battery	TLi010CA	ZhongShan Tianmao Battery Co., Ltd.
AE2	Headset	JWEP1259-M01R	Huizhou Juwei Electronics Co., Ltd.
AE3	Battery	TLi010CB	Shenzhen Aerospace Electronic Co.,Ltd.

*AE ID: is used to identify the test sample in the lab internally.

4.4. General Description

According to “Justification Letter” provided by applicant, the table below shows the difference between T311A and T311E:

Model	T311A (Original)	T311E (Variant)
Differences		
SW Version	T311A_OFCO_1SIM_V1.0_20221208_UNLOCK	T311E_OFCO_2SIM_V1.0_20230922_UNLOCK
SIM	Single SIM	Dual SIM
Battery	TLi010CA	TLi010CB (Secondary Supply)

We'll perform Variant product for spot check test. The results of spot check are presented in annex K.

5. Test Methodology

5.1. Applicable Limit Regulations

ANSI C95.1:1992 IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.

It specifies the maximum exposure limit of **1.6 W/kg** as averaged over any 1 gram of tissue for portable devices being used within 20 cm of the user in the uncontrolled environment.

5.2. Applicable Measurement Standards

IEEE 1528:2013 Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Experimental Techniques.

KDB 447498 D01 General RF Exposure Guidance v06 RF Exposure Procedures and Equipment Authorization Policies for Mobile and Portable Devices

KDB 648474 D04 Handset SAR v01r03 SAR Evaluation Considerations for Wireless Handsets.

KDB 941225 D01 SAR test for 3G devices v03r01 SAR Measurement Procedures for 3G Devices

KDB 941225 D05 SAR for LTE Devices v02r05 SAR Evaluation Considerations for LTE Devices

KDB 865664 D01 SAR measurement 100 MHz to 6 GHz v01r04 SAR Measurement Requirements for 100 MHz to 6 GHz

KDB 865664 D02 RF Exposure Reporting v01r02 RF Exposure Compliance Reporting and Documentation Considerations

TCB workshop April 2019: RF Exposure Procedures

6. Specific Absorption Rate (SAR)

6.1. Introduction

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

6.2. SAR Definition

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

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

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

SAR measurement can be either related to the temperature elevation in tissue by

$$SAR = c \left(\frac{\delta T}{\delta t} \right)$$

Where: C is the specific heat capacity, δT is the temperature rise and δt is the exposure duration, or related to the electrical field in the tissue by

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

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

However for evaluating SAR of low power transmitter, electrical field measurement is typically applied.

7. Tissue Simulating Liquids

7.1. Targets for tissue simulating liquid

Table 7.1: Targets for tissue simulating liquid

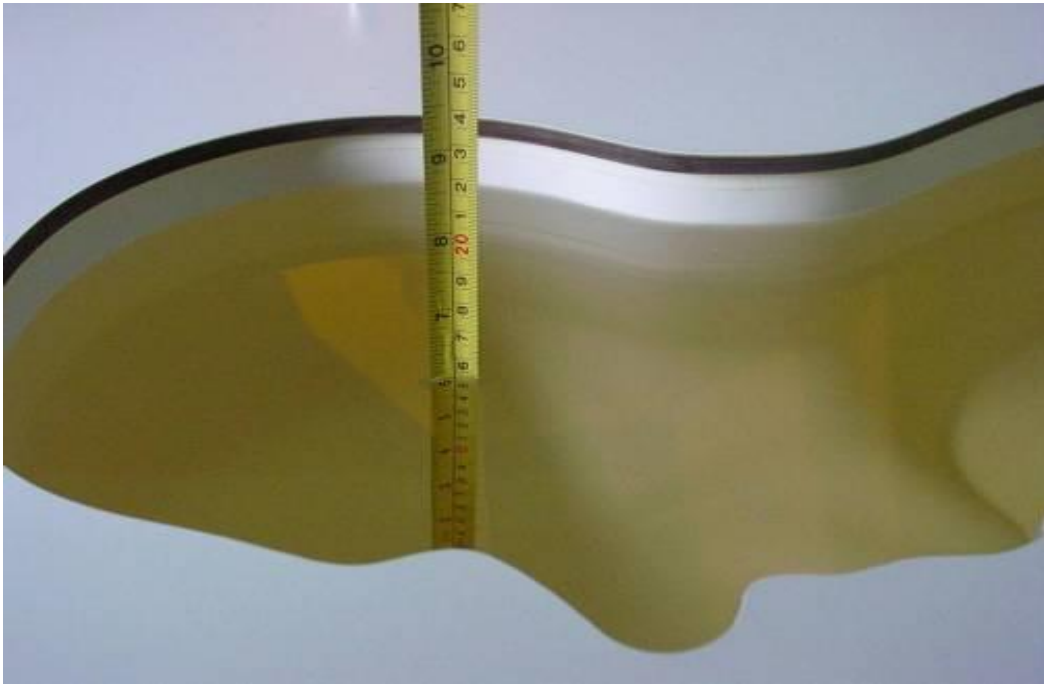
Frequency (MHz)	Liquid Type	Conductivity (σ)	$\pm 5\%$ Range	Permittivity (ϵ)	$\pm 5\%$ Range
750	Head	0.89	0.85~0.93	41.9	39.8~44.0
835	Head	0.90	0.86~0.95	41.5	39.4~43.6
1750	Head	1.37	1.30~1.44	40.1	38.1~42.1
1900	Head	1.40	1.33~1.47	40.0	38.0~42.0
2450	Head	1.80	1.71~1.89	39.2	37.2~41.2
2550	Head	1.91	1.81~2.01	39.1	37.1~41.0

7.2. Dielectric Performance

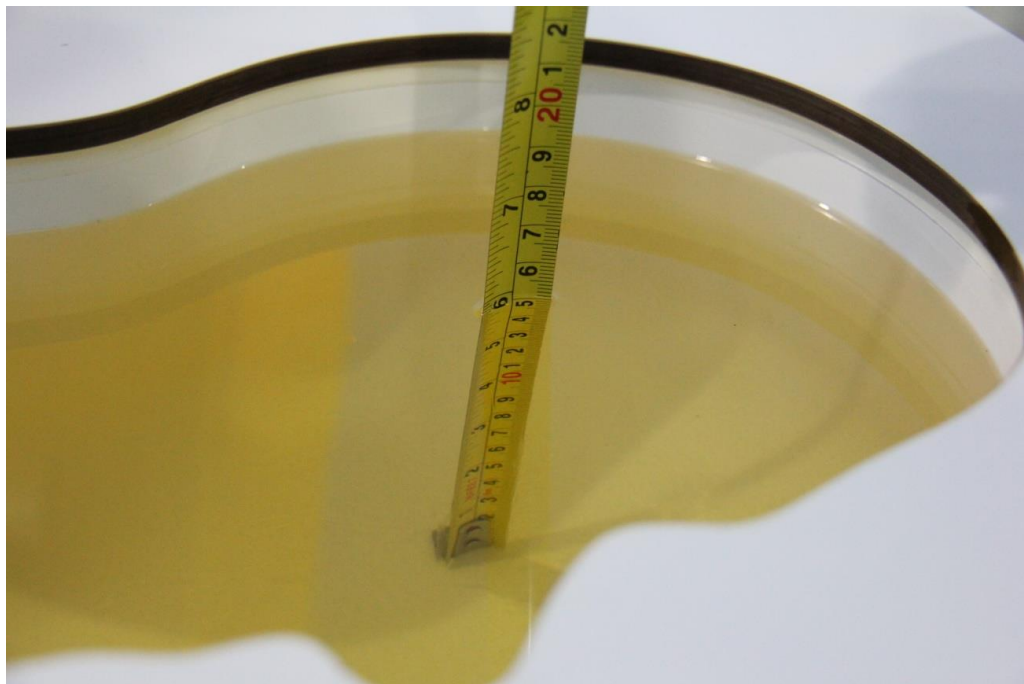
Table 7.2: Dielectric Performance of Tissue Simulating Liquid

Measurement Date (yyyy-mm-dd)	Type	Frequency (MHz)	Conductivity σ (S/m)	Drift (%)	Permittivity ϵ	Drift (%)
2022-12-20	750	Head	0.866	-2.70	42.52	1.48
2022-12-25	835	Head	0.917	1.89	40.49	-2.43
2022-12-19	1750	Head	1.393	1.68	39.27	-2.07
2022-12-26	1900	Head	1.425	1.79	38.69	-3.28
2022-12-17	2450	Head	1.833	1.83	38.45	-1.91
2022-12-27	2550	Head	1.939	1.52	38.03	-2.74
2023-10-12	835	Head	0.884	-1.78	42.16	1.59
2023-10-12	1750	Head	1.363	-0.51	40.59	1.22

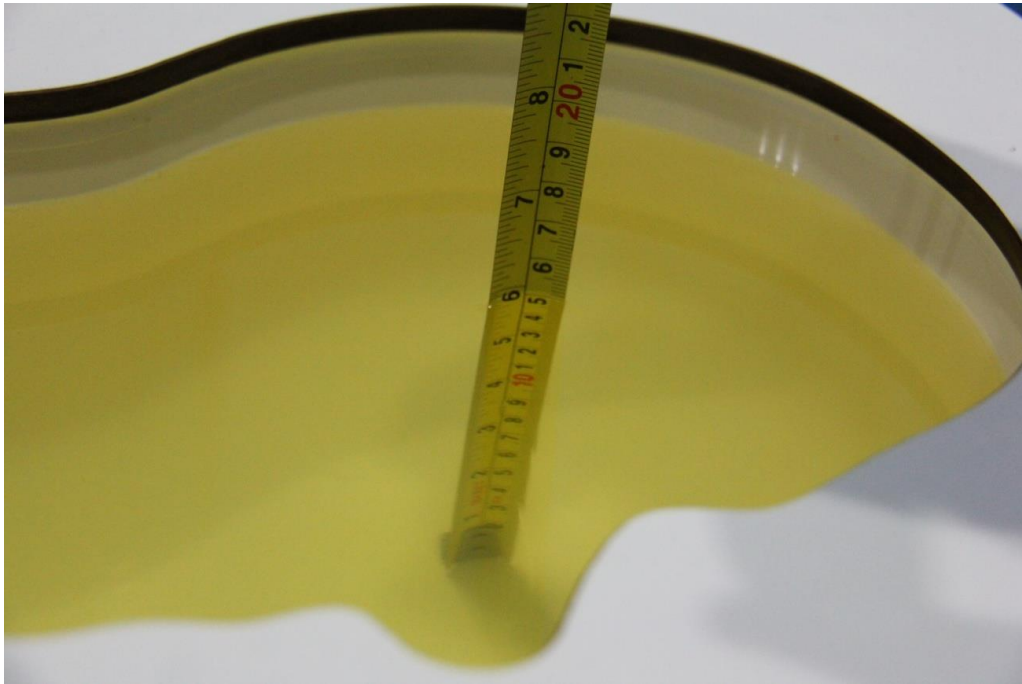
Note: The liquid temperature is 22.0°C.



Picture 7-1: Liquid depth in the Head Phantom (750MHz)



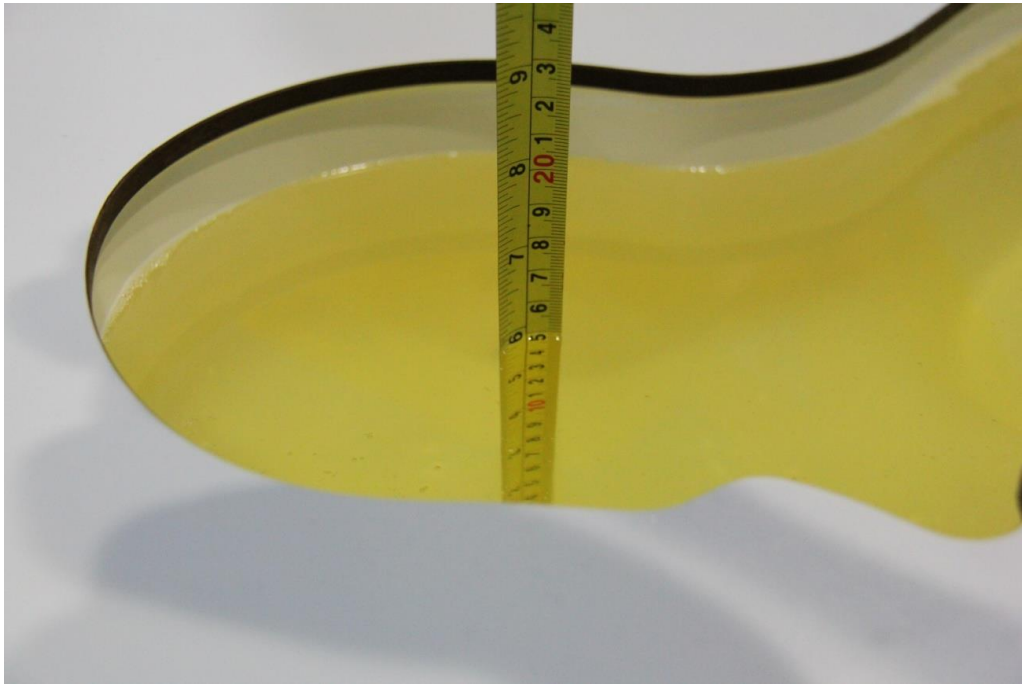
Picture 7-2: Liquid depth in the Head Phantom (835MHz)



Picture 7-3: Liquid depth in the Head Phantom (1750MHz)



Picture 7-4: Liquid depth in the Head Phantom (1900MHz)



Picture 7-5: Liquid depth in the Head Phantom (2450MHz)

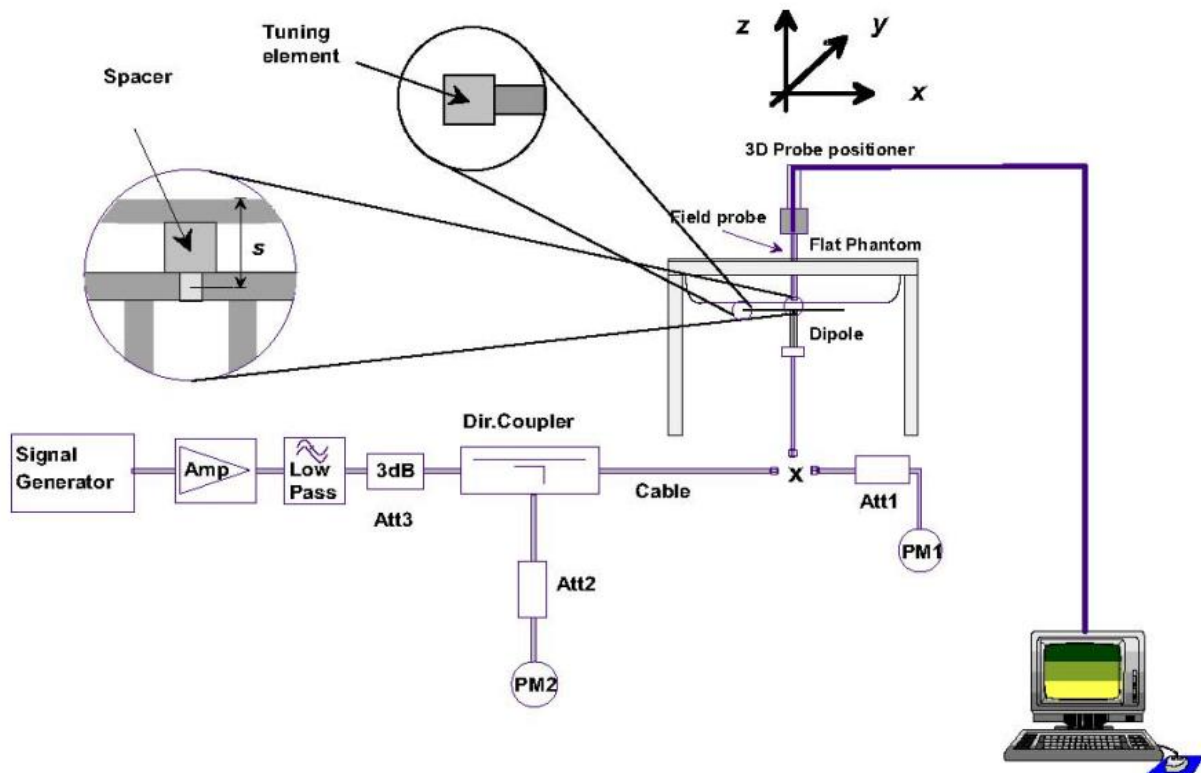


Picture 7-6: Liquid depth in the Head Phantom (2550MHz)

8. System verification

8.1. System Setup

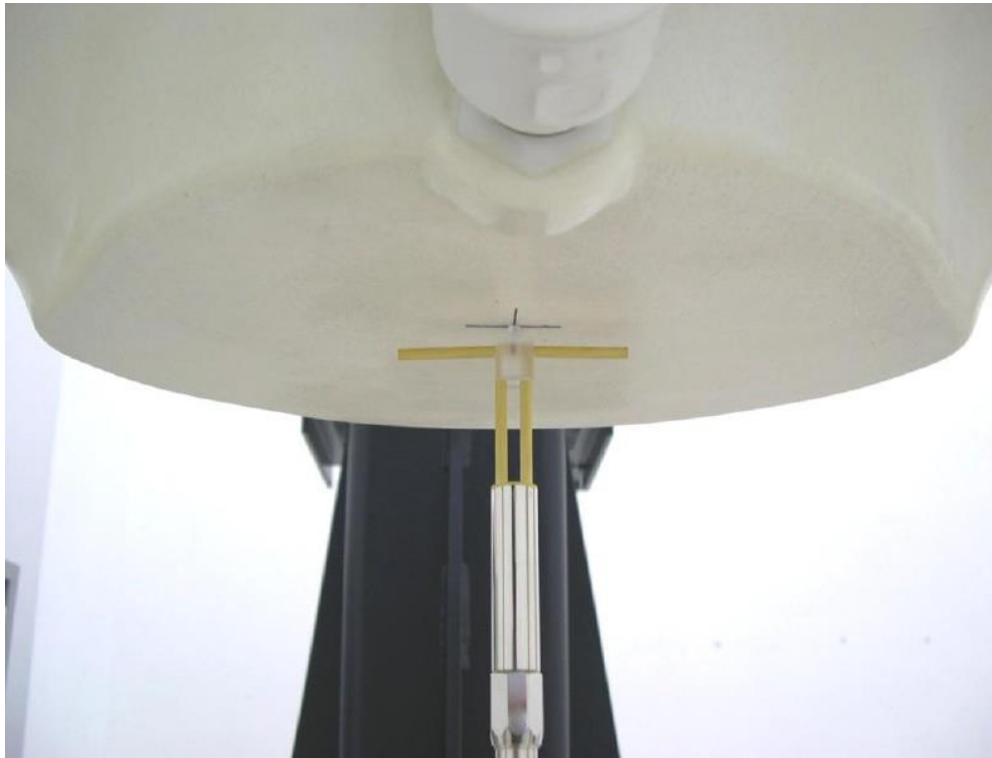
In the simplified setup for system evaluation, the DUT is replaced by a calibrated dipole and the power source is replaced by a continuous wave that comes from a signal generator. The calibrated dipole must be placed beneath the flat phantom section of the SAM twin phantom with the correct distance holder. The distance holder should touch the phantom surface with a light pressure at the reference marking and be oriented parallel to the long side of the phantom. The equipment setup is shown below:



Picture 8.1 System Setup for System Evaluation

For the dipole below 3GHz, the output power on dipole port must be calibrated to 24 dBm (250mW) before dipole is connected.

For the dipole above 3GHz, the output power on dipole port must be calibrated to 20 dBm (100mW) before dipole is connected.



Picture 8.2 Photo of Dipole Setup

8.2. System Verification

SAR system verification is required to confirm measurement accuracy, according to the tissue dielectric media, probe calibration points and other system operating parameters required for measuring the SAR of a test device. The system verification must be performed for each frequency band and within the valid range of each probe calibration point required for testing the device.

Table 8.1: System Verification of Head

Measurement Date	Frequency (MHz)	Target value (W/kg)		Measured value (W/kg)				Deviation (%)	
		10 g	1 g	/		Normalize to 1W		10 g	1 g
				10 g	1 g	10 g	1 g		
2022-12-20	750	5.62	8.48	1.36	2.03	5.44	8.12	-3.20	-4.25
2022-12-25	835	6.29	9.64	1.61	2.50	6.44	10.00	2.38	3.73
2022-12-19	1750	19.60	36.30	5.05	9.47	20.20	37.88	3.06	4.35
2022-12-26	1900	20.50	40.20	5.29	10.5	21.16	42.00	3.22	4.48
2022-12-17	2450	24.20	53.20	6.16	13.8	24.64	55.20	1.82	3.76
2022-12-27	2550	25.20	55.90	6.39	14.3	25.56	57.20	1.43	2.33
2023-10-12	835	6.29	9.64	1.55	2.33	6.20	9.32	-1.43	-3.32
2023-10-12	1750	19.60	36.30	4.84	8.82	19.36	35.28	-1.22	-2.81

9. Measurement Procedures

9.1. Tests to be performed

In order to determine the highest value of the peak spatial-average SAR of a handset, all device positions, configurations and operational modes shall be tested for each frequency band according to steps 1 to 3 below. A flowchart of the test process is shown in picture 9.1.

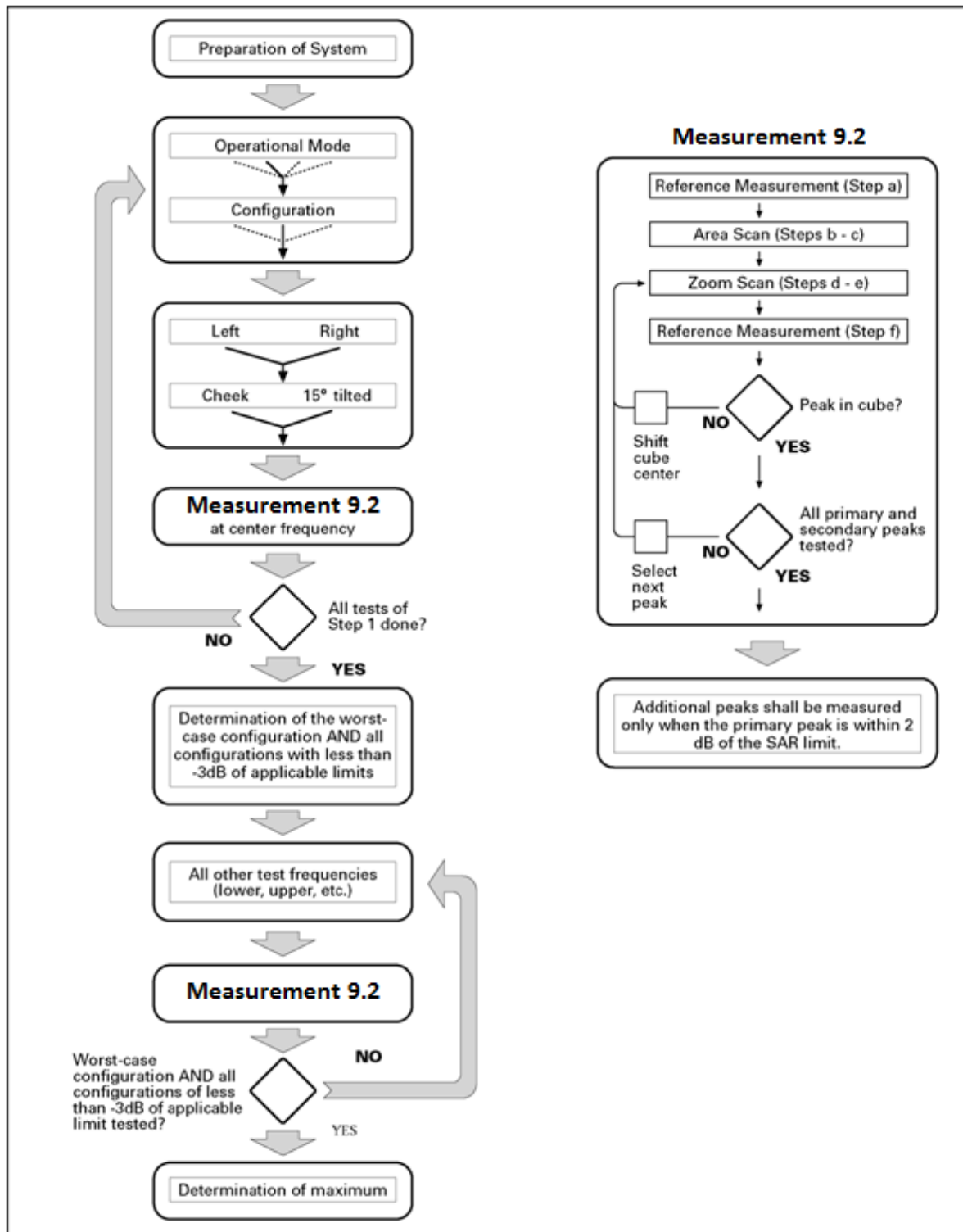
Step 1: The tests described in 9.2 shall be performed at the channel that is closest to the center of the transmit frequency band (f_c) for:

- a) all device positions (cheek and tilt, for both left and right sides of the SAM phantom, as described in annex D),
- b) all configurations for each device position in a), e.g., antenna extended and retracted, and
- c) all operational modes, e.g., analogue and digital, for each device position in a) and configuration in b) in each frequency band.

If more than three frequencies need to be tested according to 11.1 (i.e., $N_c > 3$), then all frequencies, configurations and modes shall be tested for all of the above test conditions.

Step 2: For the condition providing highest peak spatial-average SAR determined in Step 1, perform all tests described in 9.2 at all other test frequencies, i.e., lowest and highest frequencies. In addition, for all other conditions (device position, configuration and operational mode) where the peak spatial-average SAR value determined in Step 1 is within 3 dB of the applicable SAR limit, it is recommended that all other test frequencies shall be tested as well.

Step 3: Examine all data to determine the highest value of the peak spatial-average SAR found in Steps 1 to 2.



Picture 9.1 Block diagram of the tests to be performed

9.2. General Measurement Procedure

The area and zoom scan resolutions specified in the table below must be applied to the SAR measurements and fully documented in SAR reports to qualify for TCB approval. Probe boundary effect error compensation is required for measurements with the probe tip closer than half a probe tip diameter to the phantom surface. Both the probe tip diameter and sensor offset distance must satisfy measurement protocols; to ensure probe boundary effect errors are minimized and the higher fields closest to the phantom surface can be correctly measured and extrapolated to the phantom surface for computing 1-g SAR. Tolerances of the post-processing algorithms must be verified by the test laboratory for the scan resolutions used in the SAR measurements, according to the reference distribution functions specified in IEEE Std 1528-2013. The results should be documented as part of the system validation records and may be requested to support test results when all the measurement parameters in the following table are not satisfied.

		≤ 3 GHz	> 3 GHz	
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface		5 ± 1 mm	$\frac{1}{2} \cdot \delta \cdot \ln(2) \pm 0.5$ mm	
Maximum probe angle from probe axis to phantom surface normal at the measurement location		$30^\circ \pm 1^\circ$	$20^\circ \pm 1^\circ$	
Maximum area scan spatial resolution: $\Delta x_{Area}, \Delta y_{Area}$		≤ 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 \leq the corresponding x or y dimension of the test device with at least one measurement point on the test device.		
Maximum zoom scan spatial resolution: $\Delta x_{Zoom}, \Delta y_{Zoom}$		≤ 2 GHz: ≤ 8 mm 2 – 3 GHz: ≤ 5 mm*	3 – 4 GHz: ≤ 5 mm* 4 – 6 GHz: ≤ 4 mm*	
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{Zoom}(n)$	≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm	
	graded grid	$\Delta z_{Zoom}(1)$: between 1 st two points closest to phantom surface	≤ 4 mm	3 – 4 GHz: ≤ 3 mm 4 – 5 GHz: ≤ 2.5 mm 5 – 6 GHz: ≤ 2 mm
		$\Delta z_{Zoom}(n>1)$: between subsequent points	$\leq 1.5 \cdot \Delta z_{Zoom}(n-1)$	
Minimum zoom scan volume	x, y, z	≥ 30 mm	3 – 4 GHz: ≥ 28 mm 4 – 5 GHz: ≥ 25 mm 5 – 6 GHz: ≥ 22 mm	
Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details. * When zoom scan is required and the <i>reported</i> SAR from the area scan based 1-g SAR estimation procedures of KDB 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.				

9.3. WCDMA Measurement Procedures for SAR

The following procedures are applicable to WCDMA handsets operating under 3GPP Release99, Release 5 and Release 6. The default test configuration is to measure SAR with an established radio link between the DUT and a communication test set using a 12.2kbps RMC (reference measurement channel) configured in Test Loop Mode 1. SAR is selectively confirmed for other physical channel configurations (DPCCH & DPDCH_n), HSDPA and HSPA (HSUPA/HSDPA) modes according to output power, exposure conditions and device operating capabilities. Both uplink and downlink should be configured with the same RMC or AMR, when required. SAR for Release 5 HSDPA and Release 6 HSPA are measured using the applicable FRC (fixed reference channel) and E-DCH reference channel configurations. Maximum output power is verified according to applicable versions of 3GPP TS 34.121 and SAR must be measured according to these maximum output conditions. When Maximum Power Reduction (MPR) is not implemented according to Cubic Metric (CM) requirements for Release 6 HSPA, the following procedures do not apply.

For Release 5 HSDPA Data Devices:

Sub-test	β_c	β_d	β_d (SF)	β_c / β_d	β_{hs}	CM/dB
1	2/15	15/15	64	2/15	4/15	0.0
2	12/15	15/15	64	12/15	24/25	1.0
3	15/15	8/15	64	15/8	30/15	1.5
4	15/15	4/15	64	15/4	30/15	1.5

For Release 6 HSPA Data Devices

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

9.4. SAR Measurement for LTE

SAR tests for LTE are performed with a base station simulator, Anristu MT8820C. Closed loop power control was used so the UE transmits with maximum output power during SAR testing. All powers were measured with the Anristu MT8820C. It is performed for conducted power and SAR based on the KDB941225 D05.

SAR is evaluated separately according to the following procedures for the different test positions in each exposure condition – head, body, body-worn accessories and other use conditions. The procedures in the following subsections are applied separately to test each LTE frequency band.

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 among 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.

9.5. Bluetooth Measurement Procedures for SAR

Normal network operating configurations are not suitable for measuring the SAR of 802.11 transmitters in general. Unpredictable fluctuations in network traffic and antenna diversity conditions can introduce undesirable variations in SAR results. The SAR for these devices should be measured using chipset based test mode software to ensure that the results are consistent and reliable.

Chipset based test mode software is hardware dependent and generally varies among manufacturers. The device operating parameters established in a test mode for SAR measurements must be identical to those programmed in production units, including output power levels, amplifier gain settings and other RF performance tuning parameters. The test frequencies should correspond to actual channel frequencies defined for domestic use. SAR for devices with switched diversity should be measured with only one antenna transmitting at a time during each SAR measurement, according to a fixed modulation and data rate. The same data pattern should be used for all measurements.

9.6. Power Drift

To control the output power stability during the SAR test, DASY5 system calculates the power drift by measuring the E-field at the same location at the beginning and at the end of the measurement for each test position. These drift values can be found in Section 14 labeled as: (Power Drift [dB]). This ensures that the power drift during one measurement is within 5%.

10. Conducted Output Power

Table 10.1: Summary of power level - WWAN antenna

Receiver on (Head)	Receiver off (Body)
Power Level A1	Power Level B1

10.1. GSM Measurement result

During the process of testing, the EUT was controlled via Agilent Digital Radio Communication tester (E5515C) to ensure the maximum power transmission and proper modulation. This result contains conducted output power for the EUT. In all cases, the measured peak output power should be greater and within 5% than EMI measurement.

Table 10.2: The conducted power measurement results for GSM / GPRS/ EGPRS

Power Level A1/B1								
GSM 850 Speech	Tune up	Measured Power (dBm)			calculation	Averaged Power (dBm)		
		Ch.251	Ch.190	Ch.128		Ch.251	Ch.190	Ch.128
1Tx slot	33.0	31.74	31.86	31.97	/	/	/	/
GPRS850	/	Measured Power (dBm)			calculation	Averaged Power (dBm)		
		Ch.251	Ch.190	Ch.128		Ch.251	Ch.190	Ch.128
1Tx-slot	33.0	31.72	31.79	31.92	-9.03dB	22.69	22.76	22.89
2Tx-slots	31.0	30.02	30.05	30.08	-6.02dB	24.00	24.03	24.06
3Tx-slots	29.5	28.01	28.60	28.09	-4.26dB	23.75	24.34	23.83
4Tx-slots	27.0	26.02	26.05	26.08	-3.01dB	23.01	23.04	23.07

Power Level A1								
GSM 1900 Speech	Tune up	Measured Power (dBm)			calculation	Averaged Power (dBm)		
		Ch.810	Ch.661	Ch.512		Ch.810	Ch.661	Ch.512
1Tx slot	30.0	28.57	28.76	28.88	/	/	/	/
GPRS1900	/	Measured Power (dBm)			calculation	Averaged Power (dBm)		
		Ch.810	Ch.661	Ch.512		Ch.810	Ch.661	Ch.512
1Tx-slot	30.0	28.64	28.76	28.94	-9.03dB	19.61	19.73	19.91
2Tx-slots	28.0	26.75	26.72	26.72	-6.02dB	20.73	20.70	20.70
3Tx-slots	26.0	25.17	25.13	25.13	-4.26dB	20.91	20.87	20.87
4Tx-slots	24.0	23.06	23.07	23.09	-3.01dB	20.05	20.06	20.08
Power Level B1								
GSM 1900 Speech	Tune up	Measured Power (dBm)			calculation	Averaged Power (dBm)		
		Ch.810	Ch.661	Ch.512		Ch.810	Ch.661	Ch.512
1Tx slot	30.0	28.64	28.79	28.94	/	/	/	/
GPRS1900	/	Measured Power (dBm)			calculation	Averaged Power (dBm)		
		Ch.810	Ch.661	Ch.512		Ch.810	Ch.661	Ch.512
1Tx-slot	28.0	26.82	26.77	26.75	-9.03dB	17.79	17.74	17.72
2Tx-slots	26.0	25.22	25.18	25.18	-6.02dB	19.20	19.16	19.16
3Tx-slots	24.0	23.12	23.12	23.13	-4.26dB	18.86	18.86	18.87
4Tx-slots	22.0	21.22	21.24	21.27	-3.01dB	18.21	18.23	18.26

Notes:

1) Division Factors

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

1TX-slot = 1 transmit time slot out of 8 time slots=> conducted power divided by (8/1) => -9.03dB

2TX-slots = 2 transmit time slots out of 8 time slots=> conducted power divided by (8/2) => -6.02dB

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

4TX-slots = 4 transmit time slots out of 8 time slots=> conducted power divided by (8/4) => -3.01dB

According to the conducted power as above, the body measurements are performed with 3Tx slots for GSM850 and 2Tx slots for GSM1900.

10.2. WCDMA Measurement result

Table 10.3: The conducted power measurement results WCDMA

Power Level A1					
Item	band	WCDMA Band 2			
	ARFCN	Tune up	Ch.9538 (1907.6MHz)	Ch.9400 (1880MHz)	Ch.9262 (1852.4MHz)
WCDMA	\	24.0	22.70	22.60	22.90
HSUPA	1	19.0	17.80	17.80	17.90
	2	19.0	17.70	17.70	17.90
	3	19.0	17.60	17.60	17.80
	4	19.5	18.10	18.10	18.30
	5	20.5	19.30	19.30	19.50
HSDPA	1	22.0	20.70	20.70	20.90
	2	22.0	20.80	20.80	21.00
	3	21.5	20.70	20.70	20.90
	4	21.5	20.70	20.70	20.90
Power Level B1					
Item	band	WCDMA Band 2			
	ARFCN	Tune up	Ch.9538 (1907.6MHz)	Ch.9400 (1880MHz)	Ch.9262 (1852.4MHz)
WCDMA	\	22.0	20.60	21.00	21.30
HSUPA	1	17.0	16.00	16.00	16.10
	2	17.0	16.10	16.10	16.20
	3	17.0	16.00	16.00	16.10
	4	17.5	16.50	16.50	16.60
	5	18.5	17.70	17.70	17.80
HSDPA	1	20.0	19.00	19.00	19.10
	2	20.0	19.10	19.10	19.10
	3	19.5	19.00	19.00	19.10
	4	19.5	19.00	19.00	19.10

Power Level A1/B1					
Item	band	WCDMA Band 4			
	ARFCN	Tune up	Ch.1513 (1752.6MHz)	Ch.1413 (1732.6MHz)	Ch.1312 (1712.4MHz)
WCDMA	\	24.0	23.30	23.10	22.90
HSUPA	1	21.0	19.50	19.30	19.50
	2	21.0	19.50	19.40	19.50
	3	21.0	19.40	19.30	19.40
	4	21.5	20.10	19.90	20.10
	5	22.5	21.20	21.00	21.20
HSDPA	1	22.5	21.20	21.10	21.20
	2	22.5	21.30	21.20	21.30
	3	22.0	21.20	21.00	21.20
	4	22.0	21.20	21.00	21.20
Power Level A1/B1					
Item	band	WCDMA Band 5			
	ARFCN	Tune up	Ch.4233 (846.6MHz)	Ch.4183 (836.6MHz)	Ch.4132 (826.4MHz)
WCDMA	\	24.0	23.00	23.00	22.90
HSUPA	1	19.0	17.90	17.80	17.80
	2	19.0	17.90	17.90	17.90
	3	19.0	17.80	17.80	17.80
	4	19.5	18.20	18.20	18.20
	5	20.5	19.40	19.40	19.40
HSDPA	1	22.0	20.80	20.70	20.70
	2	22.0	20.80	20.80	20.80
	3	21.5	20.70	20.70	20.70
	4	21.5	20.70	20.70	20.70

10.3. LTE Measurement result

Table 10.4: The conducted Power for LTE

Power Level A1											
LTE Band 2			Actual output Power (dBm)			Tune up					
Band -width	RB No. / RB offset	Frequency (MHz)	Modulation			Modulation					
			QPSK	16QAM	64QAM	QPSK	16QAM	64QAM			
1.4 MHz	1RB_5	1909.3	22.25	21.84	21.79	24.0	23.0	23.0			
		1880.0	22.50	21.63	21.94						
		1850.7	22.64	22.18	22.31						
	1RB_3	1909.3	22.19	21.88	21.85						
		1880.0	22.51	21.64	21.83						
		1850.7	22.59	22.17	22.23						
	1RB_0	1909.3	22.18	21.83	21.90						
		1880.0	22.51	21.75	21.85						
		1850.7	22.54	22.19	22.30						
	3RB_3	1909.3	22.28	21.58	21.81						
		1880.0	22.57	21.64	21.99						
		1850.7	22.69	21.98	22.17						
	3RB_1	1909.3	22.37	21.63	21.77						
		1880.0	22.63	21.71	22.00						
		1850.7	22.68	21.99	22.19						
	3RB_0	1909.3	22.34	21.63	21.76						
		1880.0	22.57	21.63	22.05						
		1850.7	22.69	22.04	22.15						
	6RB_0	1909.3	21.33	20.08	20.86				23.0	22.0	22.0
		1880.0	21.54	20.41	21.09						
		1850.7	21.72	20.63	21.03						



Power Level A1								
LTE Band 2			Actual output Power (dBm)			Tune up		
Band -width	RB No. / RB offset	Frequency (MHz)	Modulation			Modulation		
			QPSK	16QAM	64QAM	QPSK	16QAM	64QAM
3 MHz	1RB_14	1908.5	22.42	21.86	21.73	24.0	23.0	23.0
		1880.0	22.49	21.39	21.66			
		1851.5	22.58	21.99	22.22			
	1RB_7	1908.5	22.48	21.85	21.73			
		1880.0	22.50	21.48	21.66			
		1851.5	22.55	22.12	22.20			
	1RB_0	1908.5	22.25	21.90	21.76			
		1880.0	22.55	21.47	21.67			
		1851.5	22.57	22.15	22.18			
	8RB_7	1908.5	21.63	20.48	20.84	23.0	22.0	22.0
		1880.0	21.61	20.59	21.01			
		1851.5	21.71	20.95	21.11			
	8RB_4	1908.5	21.63	20.50	20.88			
		1880.0	21.69	20.60	20.96			
		1851.5	21.73	21.00	21.09			
	8RB_0	1908.5	21.41	20.52	20.85			
		1880.0	21.59	20.63	20.96			
		1851.5	21.76	20.96	21.07			
	15RB_0	1908.5	21.59	20.45	20.96			
		1880.0	21.53	20.59	21.06			
		1851.5	21.67	20.89	21.06			



Power Level A1								
LTE Band 2			Actual output Power (dBm)			Tune up		
Band -width	RB No. / RB offset	Frequency (MHz)	Modulation			Modulation		
			QPSK	16QAM	64QAM	QPSK	16QAM	64QAM
5 MHz	1RB_24	1907.5	22.14	21.79	22.03	24.0	23.0	23.0
		1880.0	22.41	21.87	21.96			
		1852.5	22.59	22.15	22.18			
	1RB_12	1907.5	22.21	21.90	21.94			
		1880.0	22.38	21.94	21.99			
		1852.5	22.62	22.37	22.21			
	1RB_0	1907.5	22.26	21.88	22.00			
		1880.0	22.47	22.02	22.05			
		1852.5	22.60	22.37	22.16			
	12RB_13	1907.5	21.30	20.46	20.97	23.0	22.0	22.0
		1880.0	21.43	20.66	20.89			
		1852.5	21.75	20.22	21.20			
	12RB_6	1907.5	21.35	21.16	20.99			
		1880.0	21.52	21.11	20.99			
		1852.5	21.70	21.11	21.16			
	12RB_0	1907.5	21.39	21.44	20.94			
		1880.0	21.16	20.85	20.91			
		1852.5	21.17	20.77	21.17			
	25RB_0	1907.5	21.31	20.25	21.03			
		1880.0	21.53	20.82	21.01			
		1852.5	21.73	20.06	21.15			



Power Level A1								
LTE Band 2			Actual output Power (dBm)			Tune up		
Band -width	RB No. / RB offset	Frequency (MHz)	Modulation			Modulation		
			QPSK	16QAM	64QAM	QPSK	16QAM	64QAM
10 MHz	1RB_49	1905.0	22.69	21.86	22.32	24.0	23.0	23.0
		1880.0	22.86	21.64	22.61			
		1855.0	23.07	21.75	22.65			
	1RB_24	1905.0	22.75	21.96	22.44			
		1880.0	22.95	21.68	22.52			
		1855.0	23.10	21.81	22.64			
	1RB_0	1905.0	22.85	21.97	22.48			
		1880.0	23.02	21.76	22.64			
		1855.0	23.11	21.90	22.59			
	25RB_25	1905.0	21.37	20.63	20.91	23.0	22.0	22.0
		1880.0	21.57	20.57	21.01			
		1855.0	21.72	20.76	21.10			
	25RB_12	1905.0	21.30	20.66	20.87			
		1880.0	21.61	20.62	21.08			
		1855.0	21.67	20.75	21.08			
	25RB_0	1905.0	21.36	20.63	20.94			
		1880.0	21.66	20.67	21.11			
		1855.0	21.78	20.84	21.09			
	50RB_0	1905.0	21.36	20.45	20.97			
		1880.0	21.62	20.62	21.06			
		1855.0	21.73	20.75	21.01			



Power Level A1								
LTE Band 2			Actual output Power (dBm)			Tune up		
Band -width	RB No. / RB offset	Frequency (MHz)	Modulation			Modulation		
			QPSK	16QAM	64QAM	QPSK	16QAM	64QAM
15 MHz	1RB_74	1902.5	22.69	21.88	22.37	24.0	23.0	23.0
		1880.0	22.82	22.49	22.51			
		1857.5	23.05	21.62	22.55			
	1RB_37	1902.5	22.76	21.86	22.43			
		1880.0	22.91	21.57	22.61			
		1857.5	23.04	21.67	22.45			
	1RB_0	1902.5	22.75	21.91	22.52			
		1880.0	22.99	21.68	22.69			
		1857.5	23.09	21.85	22.63			
	36RB_38	1902.5	21.30	20.49	20.96	23.0	22.0	22.0
		1880.0	21.47	20.61	21.02			
		1857.5	21.70	20.79	21.13			
	36RB_19	1902.5	21.35	20.51	20.97			
		1880.0	21.57	20.67	21.10			
		1857.5	21.75	20.85	21.17			
	36RB_0	1902.5	21.42	20.55	20.95			
		1880.0	21.58	20.70	21.10			
		1857.5	21.71	20.80	21.06			
	75RB_0	1902.5	21.36	20.39	20.91			
		1880.0	21.57	20.73	21.12			
		1857.5	21.73	20.85	21.17			



Power Level A1								
LTE Band 2			Actual output Power (dBm)			Tune up		
Band -width	RB No. / RB offset	Frequency (MHz)	Modulation			Modulation		
			QPSK	16QAM	64QAM	QPSK	16QAM	64QAM
20 MHz	1RB_99	1900.0	22.68	22.36	22.35	24.0	23.0	23.0
		1880.0	22.90	21.47	22.15			
		1860.0	23.10	22.27	22.81			
	1RB_50	1900.0	22.82	22.46	22.34			
		1880.0	22.99	21.60	22.29			
		1860.0	23.11	22.20	22.77			
	1RB_0	1900.0	22.83	22.48	22.44			
		1880.0	23.17	21.77	22.26			
		1860.0	23.23	22.27	22.75			
	50RB_50	1900.0	21.45	20.69	20.87	23.0	22.0	22.0
		1880.0	21.55	20.95	21.10			
		1860.0	21.70	20.99	21.00			
	50RB_25	1900.0	21.43	20.80	20.91			
		1880.0	21.57	20.90	21.09			
		1860.0	21.69	21.09	21.06			
	50RB_0	1900.0	21.46	20.82	20.93			
		1880.0	21.64	20.96	21.12			
		1860.0	21.71	21.13	21.10			
	100RB_0	1900.0	21.44	20.78	20.84			
		1880.0	21.51	20.93	21.12			
		1860.0	21.66	21.09	21.04			



Power Level B1											
LTE Band 2			Actual output Power (dBm)			Tune up					
Band -width	RB No. / RB offset	Frequency (MHz)	Modulation			Modulation					
			QPSK	16QAM	64QAM	QPSK	16QAM	64QAM			
1.4 MHz	1RB_5	1909.3	19.53	18.85	18.53	21.0	20.0	20.0			
		1880.0	19.45	18.53	18.11						
		1850.7	19.70	19.15	18.63						
	1RB_3	1909.3	19.44	18.93	18.54						
		1880.0	19.40	18.51	18.22						
		1850.7	19.70	19.24	18.74						
	1RB_0	1909.3	19.43	18.89	18.58						
		1880.0	19.50	18.53	18.25						
		1850.7	19.66	19.23	18.71						
	3RB_3	1909.3	19.59	18.80	18.45						
		1880.0	19.58	18.57	18.49						
		1850.7	19.69	18.97	18.78						
	3RB_1	1909.3	19.51	18.78	18.48						
		1880.0	19.54	18.62	18.52						
		1850.7	19.67	18.99	18.78						
	3RB_0	1909.3	19.50	18.79	18.48						
		1880.0	19.49	18.57	18.55						
		1850.7	19.70	18.91	18.73						
	6RB_0	1909.3	18.53	18.84	18.67				20.0	20.0	20.0
		1880.0	18.48	18.80	18.63						
		1850.7	18.72	18.60	18.48						



Power Level B1								
LTE Band 2			Actual output Power (dBm)			Tune up		
Band -width	RB No. / RB offset	Frequency (MHz)	Modulation			Modulation		
			QPSK	16QAM	64QAM	QPSK	16QAM	64QAM
3 MHz	1RB_14	1908.5	19.47	18.87	18.65	21.0	20.0	20.0
		1880.0	19.44	18.54	18.27			
		1851.5	19.57	19.40	18.87			
	1RB_7	1908.5	19.45	18.80	18.68			
		1880.0	19.44	18.60	18.31			
		1851.5	19.53	19.37	18.96			
	1RB_0	1908.5	19.27	18.67	18.47			
		1880.0	19.50	18.55	18.35			
		1851.5	19.59	19.25	18.98			
	8RB_7	1908.5	18.48	18.80	18.35	20.0	20.0	20.0
		1880.0	18.50	18.79	18.53			
		1851.5	18.69	18.91	18.43			
	8RB_4	1908.5	18.59	18.75	18.32			
		1880.0	18.58	18.90	18.63			
		1851.5	18.81	18.88	18.40			
	8RB_0	1908.5	18.41	18.55	18.24			
		1880.0	18.45	18.92	18.68			
		1851.5	18.81	18.72	18.24			
	15RB_0	1908.5	18.55	18.62	18.29			
		1880.0	18.52	18.86	18.61			
		1851.5	18.76	18.84	18.38			

Power Level B1								
LTE Band 2			Actual output Power (dBm)			Tune up		
Band -width	RB No. / RB offset	Frequency (MHz)	Modulation			Modulation		
			QPSK	16QAM	64QAM	QPSK	16QAM	64QAM
5 MHz	1RB_24	1907.5	19.48	18.98	18.59	21.0	20.0	20.0
		1880.0	19.32	18.93	18.48			
		1852.5	19.73	19.31	18.93			
	1RB_12	1907.5	19.29	18.74	18.53			
		1880.0	19.34	18.98	18.58			
		1852.5	19.57	19.10	18.78			
	1RB_0	1907.5	19.28	18.64	18.37			
		1880.0	19.45	19.03	18.56			
		1852.5	19.62	19.13	18.83			
	12RB_13	1907.5	18.63	18.49	18.19	20.0	20.0	20.0
		1880.0	18.58	18.65	18.40			
		1852.5	18.66	19.19	18.70			
	12RB_6	1907.5	18.30	18.52	18.24			
		1880.0	18.49	18.92	18.66			
		1852.5	18.79	19.09	18.60			
	12RB_0	1907.5	18.33	18.40	18.17			
		1880.0	18.47	18.88	18.64			
		1852.5	18.80	18.75	18.26			
	25RB_0	1907.5	18.31	18.47	18.24			
		1880.0	18.54	18.82	18.58			
		1852.5	18.77	18.99	18.51			



Power Level B1								
LTE Band 2			Actual output Power (dBm)			Tune up		
Band -width	RB No. / RB offset	Frequency (MHz)	Modulation			Modulation		
			QPSK	16QAM	64QAM	QPSK	16QAM	64QAM
10 MHz	1RB_49	1905.0	19.86	19.55	19.24	21.0	20.0	20.0
		1880.0	20.12	19.21	19.55			
		1855.0	20.13	19.13	19.53			
	1RB_24	1905.0	19.68	19.41	18.97			
		1880.0	19.96	18.98	19.30			
		1855.0	20.32	19.40	19.75			
	1RB_0	1905.0	19.73	19.39	19.09			
		1880.0	20.10	19.08	19.44			
		1855.0	20.23	19.29	19.50			
	25RB_25	1905.0	18.36	18.75	18.60	20.0	20.0	20.0
		1880.0	18.47	19.03	18.84			
		1855.0	18.97	19.30	18.96			
	25RB_12	1905.0	18.23	18.80	18.70			
		1880.0	18.52	18.99	18.78			
		1855.0	18.92	18.55	18.26			
	25RB_0	1905.0	18.59	19.22	19.20			
		1880.0	18.61	19.10	18.98			
		1855.0	18.78	18.22	18.37			
	50RB_0	1905.0	18.30	19.03	18.92			
		1880.0	18.54	19.10	18.90			
		1855.0	18.91	18.61	18.40			



Power Level B1								
LTE Band 2			Actual output Power (dBm)			Tune up		
Band -width	RB No. / RB offset	Frequency (MHz)	Modulation			Modulation		
			QPSK	16QAM	64QAM	QPSK	16QAM	64QAM
15 MHz	1RB_74	1902.5	19.94	19.52	19.26	21.0	20.0	20.0
		1880.0	19.82	19.02	18.92			
		1857.5	20.31	19.27	19.57			
	1RB_37	1902.5	20.00	19.55	19.33			
		1880.0	19.80	19.02	18.96			
		1857.5	20.22	19.36	19.64			
	1RB_0	1902.5	19.79	19.51	19.09			
		1880.0	19.91	19.11	18.98			
		1857.5	20.22	19.24	19.46			
	36RB_38	1902.5	18.38	18.45	18.40	20.0	20.0	20.0
		1880.0	18.49	18.93	18.73			
		1857.5	18.67	19.56	19.40			
	36RB_19	1902.5	18.59	18.55	18.34			
		1880.0	18.58	18.93	18.77			
		1857.5	18.83	19.04	18.81			
	36RB_0	1902.5	18.30	19.48	19.25			
		1880.0	18.62	19.40	19.26			
		1857.5	18.94	18.30	18.15			
	75RB_0	1902.5	18.59	18.77	18.39			
		1880.0	18.50	19.15	19.02			
		1857.5	18.99	19.07	18.70			



Power Level B1								
LTE Band 2			Actual output Power (dBm)			Tune up		
Band -width	RB No. / RB offset	Frequency (MHz)	Modulation			Modulation		
			QPSK	16QAM	64QAM	QPSK	16QAM	64QAM
20 MHz	1RB_99	1900.0	19.92	18.88	19.25	21.0	20.0	20.0
		1880.0	19.80	18.94	18.70			
		1860.0	19.93	19.45	18.96			
	1RB_50	1900.0	19.82	18.71	18.99			
		1880.0	19.93	19.04	18.85			
		1860.0	20.01	19.61	19.11			
	1RB_0	1900.0	20.08	19.08	19.37			
		1880.0	19.99	19.10	18.79			
		1860.0	20.09	19.66	19.28			
	50RB_50	1900.0	18.34	18.34	18.07	20.0	20.0	20.0
		1880.0	18.72	19.40	19.19			
		1860.0	18.86	18.99	18.75			
	50RB_25	1900.0	18.35	19.15	18.94			
		1880.0	18.50	18.98	18.82			
		1860.0	18.71	18.69	18.33			
	50RB_0	1900.0	18.44	19.55	19.29			
		1880.0	18.13	19.58	19.42			
		1860.0	18.97	18.46	18.10			
	100RB_0	1900.0	18.31	19.04	18.78			
		1880.0	18.49	19.49	19.30			
		1860.0	18.67	18.50	18.34			



Power Level A1/B1											
LTE Band 4			Actual output Power (dBm)			Tune up					
Band -width	RB No. / RB offset	Frequency (MHz)	Modulation			Modulation					
			QPSK	16QAM	64QAM	QPSK	16QAM	64QAM			
1.4 MHz	1RB_5	1754.3	21.22	20.85	20.71	22.5	21.5	21.5			
		1732.5	21.12	20.38	20.49						
		1710.7	20.96	20.39	20.69						
	1RB_3	1754.3	21.22	20.97	20.67						
		1732.5	21.13	20.48	20.58						
		1710.7	20.97	20.34	20.60						
	1RB_0	1754.3	21.21	20.91	20.48						
		1732.5	21.08	20.64	20.83						
		1710.7	20.93	20.27	20.64						
	3RB_3	1754.3	21.44	20.55	20.51						
		1732.5	21.34	20.50	20.44						
		1710.7	21.19	20.53	20.57						
	3RB_1	1754.3	21.46	20.59	20.54						
		1732.5	21.30	20.51	20.49						
		1710.7	21.24	20.53	20.49						
	3RB_0	1754.3	21.41	20.54	20.52						
		1732.5	21.33	20.49	20.45						
		1710.7	21.17	20.58	20.61						
	6RB_0	1754.3	20.37	18.98	19.27				21.5	20.5	20.5
		1732.5	20.36	19.25	19.33						
		1710.7	20.28	19.25	19.40						



Power Level A1/B1								
LTE Band 4			Actual output Power (dBm)			Tune up		
Band -width	RB No. / RB offset	Frequency (MHz)	Modulation			Modulation		
			QPSK	16QAM	64QAM	QPSK	16QAM	64QAM
3 MHz	1RB_14	1753.5	21.24	20.90	20.43	22.5	21.5	21.5
		1732.5	21.05	20.90	20.27			
		1711.5	21.05	20.65	20.21			
	1RB_7	1753.5	21.25	20.89	20.49			
		1732.5	21.08	20.83	20.31			
		1711.5	21.05	20.94	20.37			
	1RB_0	1753.5	21.26	20.92	20.48			
		1732.5	21.09	21.18	20.54			
		1711.5	20.99	20.95	20.32			
	8RB_7	1753.5	20.32	19.53	19.40	21.5	20.5	20.5
		1732.5	20.27	19.46	19.27			
		1711.5	20.45	19.29	19.01			
	8RB_4	1753.5	20.38	19.47	19.26			
		1732.5	20.29	19.48	19.27			
		1711.5	20.38	19.48	19.25			
	8RB_0	1753.5	20.37	19.53	19.33			
		1732.5	20.60	19.80	19.61			
		1711.5	20.44	19.46	19.32			
	15RB_0	1753.5	20.35	19.55	19.48			
		1732.5	20.28	19.37	19.34			
		1711.5	20.32	19.45	19.46			



Power Level A1/B1								
LTE Band 4			Actual output Power (dBm)			Tune up		
Band -width	RB No. / RB offset	Frequency (MHz)	Modulation			Modulation		
			QPSK	16QAM	64QAM	QPSK	16QAM	64QAM
5 MHz	1RB_24	1752.5	21.24	20.27	20.34	22.5	21.5	21.5
		1732.5	21.08	21.06	20.96			
		1712.5	20.98	20.08	20.22			
	1RB_12	1752.5	21.17	20.25	20.32			
		1732.5	21.14	20.78	20.73			
		1712.5	20.99	20.22	20.39			
	1RB_0	1752.5	21.35	20.29	20.26			
		1732.5	21.11	21.07	20.95			
		1712.5	21.04	20.34	20.70			
	12RB_13	1752.5	20.44	19.38	19.40	21.5	20.5	20.5
		1732.5	20.26	19.38	19.41			
		1712.5	20.11	19.21	19.10			
	12RB_6	1752.5	20.40	19.42	19.45			
		1732.5	20.36	19.37	19.49			
		1712.5	20.08	19.23	19.24			
	12RB_0	1752.5	20.30	19.33	19.32			
		1732.5	20.71	19.80	19.75			
		1712.5	20.32	19.45	19.54			
	25RB_0	1752.5	20.37	19.63	19.51			
		1732.5	20.39	19.34	19.49			
		1712.5	20.11	19.35	19.28			



Power Level A1/B1								
LTE Band 4			Actual output Power (dBm)			Tune up		
Band -width	RB No. / RB offset	Frequency (MHz)	Modulation			Modulation		
			QPSK	16QAM	64QAM	QPSK	16QAM	64QAM
10 MHz	1RB_49	1750.0	21.33	20.91	20.39	22.5	21.5	21.5
		1732.5	21.14	20.52	20.67			
		1715.0	21.10	20.24	20.42			
	1RB_24	1750.0	21.32	21.05	20.38			
		1732.5	21.10	20.46	20.60			
		1715.0	21.03	20.26	20.32			
	1RB_0	1750.0	21.42	21.12	20.46			
		1732.5	21.22	20.52	20.63			
		1715.0	21.02	20.42	20.60			
	25RB_25	1750.0	20.36	19.48	19.42	21.5	20.5	20.5
		1732.5	20.76	19.84	19.79			
		1715.0	20.48	19.83	19.71			
	25RB_12	1750.0	20.49	19.44	19.51			
		1732.5	20.36	19.58	19.45			
		1715.0	20.18	19.45	19.35			
	25RB_0	1750.0	20.47	19.43	19.40			
		1732.5	20.71	19.89	19.82			
		1715.0	20.29	19.38	19.30			
	50RB_0	1750.0	20.41	19.38	19.46			
		1732.5	20.32	19.39	19.36			
		1715.0	20.17	19.23	19.24			



Power Level A1/B1								
LTE Band 4			Actual output Power (dBm)			Tune up		
Band -width	RB No. / RB offset	Frequency (MHz)	Modulation			Modulation		
			QPSK	16QAM	64QAM	QPSK	16QAM	64QAM
15 MHz	1RB_74	1747.5	21.39	20.27	20.45	22.5	21.5	21.5
		1732.5	21.32	20.35	20.53			
		1717.5	21.31	20.52	20.62			
	1RB_37	1747.5	21.29	20.40	20.35			
		1732.5	21.27	20.41	20.52			
		1717.5	21.23	20.60	20.81			
	1RB_0	1747.5	21.31	20.77	20.77			
		1732.5	21.39	20.47	20.66			
		1717.5	21.27	20.42	20.62			
	36RB_38	1747.5	20.41	19.43	19.29	21.5	20.5	20.5
		1732.5	20.77	19.72	19.83			
		1717.5	20.32	19.34	19.30			
	36RB_19	1747.5	20.48	19.63	19.43			
		1732.5	20.31	19.48	19.47			
		1717.5	20.63	19.67	19.70			
	36RB_0	1747.5	20.47	19.64	19.49			
		1732.5	20.41	19.48	19.45			
		1717.5	20.27	19.32	19.30			
	75RB_0	1747.5	20.43	19.48	19.45			
		1732.5	20.41	19.41	19.34			
		1717.5	20.56	19.63	19.61			



Power Level A1/B1								
LTE Band 4			Actual output Power (dBm)			Tune up		
Band -width	RB No. / RB offset	Frequency (MHz)	Modulation			Modulation		
			QPSK	16QAM	64QAM	QPSK	16QAM	64QAM
20 MHz	1RB_99	1745.0	21.47	20.57	20.73	22.5	21.5	21.5
		1732.5	21.38	21.34	20.91			
		1720.0	21.36	21.01	20.27			
	1RB_50	1745.0	21.35	20.64	20.85			
		1732.5	21.33	21.04	20.63			
		1720.0	21.28	20.83	20.20			
	1RB_0	1745.0	21.32	20.98	21.08			
		1732.5	21.33	21.17	20.57			
		1720.0	21.33	21.04	20.40			
	50RB_50	1745.0	20.42	19.44	19.56	21.5	20.5	20.5
		1732.5	20.41	19.33	19.33			
		1720.0	20.35	19.36	19.27			
	50RB_25	1745.0	20.48	19.50	19.48			
		1732.5	20.45	19.44	19.39			
		1720.0	20.39	19.30	19.37			
	50RB_0	1745.0	20.43	19.82	19.75			
		1732.5	20.43	19.41	19.45			
		1720.0	20.29	19.25	19.31			
	100RB_0	1745.0	20.47	19.54	19.61			
		1732.5	20.35	19.51	19.34			
		1720.0	20.27	19.42	19.29			



Power Level A1/B1											
LTE Band 5			Actual output Power (dBm)			Tune up					
Band -width	RB No. / RB offset	Frequency (MHz)	Modulation			Modulation					
			QPSK	16QAM	64QAM	QPSK	16QAM	64QAM			
1.4 MHz	1RB_5	848.3	23.43	22.44	22.40	24.5	23.5	23.5			
		836.5	23.24	22.32	22.47						
		824.7	23.15	22.17	22.15						
	1RB_3	848.3	23.42	22.52	22.36						
		836.5	23.24	22.32	22.50						
		824.7	23.20	22.20	22.13						
	1RB_0	848.3	23.44	22.47	22.35						
		836.5	23.12	22.04	22.16						
		824.7	23.17	22.16	22.25						
	3RB_3	848.3	23.55	22.48	22.67						
		836.5	23.35	22.54	22.50						
		824.7	23.19	22.54	22.52						
	3RB_1	848.3	23.50	22.57	22.68						
		836.5	23.45	22.57	22.59						
		824.7	23.31	22.55	22.46						
	3RB_0	848.3	23.47	22.60	22.70						
		836.5	23.40	22.50	22.52						
		824.7	23.32	22.51	22.48						
	6RB_0	848.3	22.42	21.62	21.83				23.5	22.5	22.5
		836.5	22.38	21.10	21.28						
		824.7	22.33	21.14	21.32						



Power Level A1/B1								
LTE Band 5			Actual output Power (dBm)			Tune up		
Band -width	RB No. / RB offset	Frequency (MHz)	Modulation			Modulation		
			QPSK	16QAM	64QAM	QPSK	16QAM	64QAM
3 MHz	1RB_14	847.5	23.44	23.03	22.53	24.5	23.5	23.5
		836.5	23.23	22.68	22.35			
		825.5	23.21	22.72	22.30			
	1RB_7	847.5	23.37	22.99	22.55			
		836.5	23.29	22.81	22.30			
		825.5	23.19	22.72	22.36			
	1RB_0	847.5	23.33	22.92	22.61			
		836.5	23.12	22.52	22.07			
		825.5	23.14	22.72	22.33			
	8RB_7	847.5	22.49	21.90	21.70	23.5	22.5	22.5
		836.5	22.37	21.37	21.14			
		825.5	22.35	21.33	21.15			
	8RB_4	847.5	22.56	21.90	21.70			
		836.5	22.29	21.37	21.16			
		825.5	22.36	21.39	21.25			
	8RB_0	847.5	22.54	21.83	21.61			
		836.5	22.12	21.44	21.19			
		825.5	22.28	21.41	21.21			
	15RB_0	847.5	22.40	21.91	21.87			
		836.5	22.44	21.31	21.33			
		825.5	22.29	21.38	21.38			

Power Level A1/B1								
LTE Band 5			Actual output Power (dBm)			Tune up		
Band -width	RB No. / RB offset	Frequency (MHz)	Modulation			Modulation		
			QPSK	16QAM	64QAM	QPSK	16QAM	64QAM
5 MHz	1RB_24	846.5	23.48	22.89	22.67	24.5	23.5	23.5
		836.5	23.15	22.20	22.42			
		826.5	23.25	22.38	22.64			
	1RB_12	846.5	23.39	22.83	22.66			
		836.5	23.26	22.26	22.51			
		826.5	23.17	22.35	22.56			
	1RB_0	846.5	23.35	22.84	22.67			
		836.5	23.14	22.22	22.46			
		826.5	23.15	22.28	22.58			
	12RB_13	846.5	22.50	21.85	22.02	23.5	22.5	22.5
		836.5	22.24	21.34	21.27			
		826.5	22.37	21.25	21.32			
	12RB_6	846.5	22.39	21.85	22.00			
		836.5	22.31	21.33	21.42			
		826.5	22.29	21.26	21.34			
	12RB_0	846.5	22.46	21.41	21.41			
		836.5	22.13	21.31	21.35			
		826.5	22.35	21.30	21.42			
	25RB_0	846.5	22.53	21.72	21.96			
		836.5	22.30	21.44	21.47			
		826.5	22.31	21.40	21.41			



Power Level A1/B1								
LTE Band 5			Actual output Power (dBm)			Tune up		
Band -width	RB No. / RB offset	Frequency (MHz)	Modulation			Modulation		
			QPSK	16QAM	64QAM	QPSK	16QAM	64QAM
10 MHz	1RB_49	844.0	23.37	22.46	22.40	24.5	23.5	23.5
		836.5	23.45	22.70	22.29			
		829.0	23.33	22.85	22.52			
	1RB_24	844.0	23.19	22.22	22.34			
		836.5	23.39	22.77	22.40			
		829.0	23.32	22.78	22.39			
	1RB_0	844.0	23.12	22.19	22.22			
		836.5	23.18	22.58	22.30			
		829.0	23.29	22.70	22.25			
	25RB_25	844.0	22.40	22.00	21.88	23.5	22.5	22.5
		836.5	22.32	21.36	21.48			
		829.0	22.46	21.35	21.41			
	25RB_12	844.0	22.29	21.53	21.40			
		836.5	22.28	21.32	21.34			
		829.0	22.23	21.24	21.28			
	25RB_0	844.0	22.17	21.39	21.27			
		836.5	22.15	21.32	21.43			
		829.0	22.32	21.26	21.28			
	50RB_0	844.0	22.43	21.43	21.39			
		836.5	22.36	21.32	21.41			
		829.0	22.23	21.21	21.23			

Power Level A1								
LTE Band 7			Actual output Power (dBm)			Tune up		
Band -width	RB No. / RB offset	Frequency (MHz)	Modulation			Modulation		
			QPSK	16QAM	64QAM	QPSK	16QAM	64QAM
5 MHz	1RB_24	2567.5	22.25	22.00	21.78	23.5	22.5	22.5
		2535.0	22.19	21.93	21.47			
		2502.5	22.23	22.02	21.60			
	1RB_12	2567.5	22.25	21.93	21.77			
		2535.0	22.26	21.92	21.54			
		2502.5	22.25	21.96	21.52			
	1RB_0	2567.5	22.21	21.87	21.71			
		2535.0	22.18	21.98	21.66			
		2502.5	22.22	22.01	21.55			
	12RB_13	2567.5	21.40	20.55	20.53	22.5	21.5	21.5
		2535.0	21.34	20.49	20.28			
		2502.5	21.23	20.48	20.28			
	12RB_6	2567.5	21.37	20.52	20.56			
		2535.0	21.36	20.49	20.33			
		2502.5	21.32	20.44	20.23			
	12RB_0	2567.5	21.33	20.48	20.51			
		2535.0	21.26	20.47	20.26			
		2502.5	21.37	20.54	20.29			
	25RB_0	2567.5	21.44	20.41	20.58			
		2535.0	21.25	20.48	20.58			
		2502.5	21.37	20.40	20.39			



Power Level A1								
LTE Band 7			Actual output Power (dBm)			Tune up		
Band -width	RB No. / RB offset	Frequency (MHz)	Modulation			Modulation		
			QPSK	16QAM	64QAM	QPSK	16QAM	64QAM
10 MHz	1RB_49	2565.0	22.32	21.76	21.80	23.5	22.5	22.5
		2535.0	22.25	21.96	21.89			
		2505.0	22.25	21.91	21.69			
	1RB_24	2565.0	22.20	21.72	21.74			
		2535.0	22.17	21.80	21.88			
		2505.0	22.33	21.82	21.82			
	1RB_0	2565.0	22.20	21.75	21.74			
		2535.0	22.33	21.74	21.78			
		2505.0	22.21	21.86	21.60			
	25RB_25	2565.0	21.39	20.74	20.66	22.5	21.5	21.5
		2535.0	21.27	20.66	20.61			
		2505.0	21.39	20.70	20.66			
	25RB_12	2565.0	21.36	20.75	20.63			
		2535.0	21.31	20.68	20.58			
		2505.0	21.33	20.68	20.67			
	25RB_0	2565.0	21.37	20.71	20.60			
		2535.0	21.34	20.60	20.52			
		2505.0	21.22	20.58	20.51			
	50RB_0	2565.0	21.30	20.51	20.52			
		2535.0	21.45	20.60	20.49			
		2505.0	21.44	20.48	20.59			

Power Level A1								
LTE Band 7			Actual output Power (dBm)			Tune up		
Band -width	RB No. / RB offset	Frequency (MHz)	Modulation			Modulation		
			QPSK	16QAM	64QAM	QPSK	16QAM	64QAM
15 MHz	1RB_74	2562.5	22.31	21.73	21.56	23.5	22.5	22.5
		2535.0	22.27	22.28	21.59			
		2507.5	22.23	22.29	21.41			
	1RB_37	2562.5	22.21	21.76	21.39			
		2535.0	22.15	22.17	21.48			
		2507.5	22.13	22.18	21.45			
	1RB_0	2562.5	22.10	21.87	21.44			
		2535.0	22.13	22.19	21.46			
		2507.5	22.12	22.11	21.41			
	36RB_38	2562.5	21.47	20.64	20.54	22.5	21.5	21.5
		2535.0	21.43	20.38	20.41			
		2507.5	21.41	20.47	20.46			
	36RB_19	2562.5	21.42	20.62	20.48			
		2535.0	21.35	20.50	20.51			
		2507.5	21.36	20.41	20.43			
	36RB_0	2562.5	21.32	20.70	20.40			
		2535.0	21.30	20.37	20.52			
		2507.5	21.36	20.41	20.45			
	75RB_0	2562.5	21.42	20.51	20.54			
		2535.0	21.46	20.66	20.53			
		2507.5	21.41	20.61	20.59			

Power Level A1								
LTE Band 7			Actual output Power (dBm)			Tune up		
Band -width	RB No. / RB offset	Frequency (MHz)	Modulation			Modulation		
			QPSK	16QAM	64QAM	QPSK	16QAM	64QAM
20 MHz	1RB_99	2560.0	22.42	22.24	21.66	23.5	22.5	22.5
		2535.0	22.33	21.71	21.78			
		2510.0	22.37	21.59	21.65			
	1RB_50	2560.0	22.32	22.15	21.54			
		2535.0	22.20	21.64	21.80			
		2510.0	22.20	21.60	21.47			
	1RB_0	2560.0	22.22	22.05	21.49			
		2535.0	22.23	21.47	21.53			
		2510.0	22.31	21.62	21.55			
	50RB_50	2560.0	21.50	20.53	20.59	22.5	21.5	21.5
		2535.0	21.37	20.58	20.52			
		2510.0	21.49	20.52	20.66			
	50RB_25	2560.0	21.34	20.54	20.60			
		2535.0	21.36	20.57	20.62			
		2510.0	21.29	20.53	20.59			
	50RB_0	2560.0	21.44	20.43	20.45			
		2535.0	21.26	20.60	20.43			
		2510.0	21.35	20.51	20.49			
	100RB_0	2560.0	21.36	20.62	20.49			
		2535.0	21.31	20.58	20.47			
		2510.0	21.34	20.50	20.48			



Power Level B1								
LTE Band 7			Actual output Power (dBm)			Tune up		
Band -width	RB No. / RB offset	Frequency (MHz)	Modulation			Modulation		
			QPSK	16QAM	64QAM	QPSK	16QAM	64QAM
5 MHz	1RB_24	2567.5	19.23	18.69	18.39	20.5	19.5	19.5
		2535.0	19.29	18.89	18.81			
		2502.5	19.32	18.89	18.70			
	1RB_12	2567.5	19.21	18.81	18.47			
		2535.0	19.27	18.82	18.64			
		2502.5	19.31	18.82	18.49			
	1RB_0	2567.5	19.28	18.77	18.47			
		2535.0	19.24	18.80	18.72			
		2502.5	19.19	18.89	18.65			
	12RB_13	2567.5	18.31	18.11	17.86	19.5	19.5	19.5
		2535.0	18.48	18.32	18.01			
		2502.5	18.35	18.78	18.46			
	12RB_6	2567.5	18.37	18.36	18.13			
		2535.0	18.36	18.50	18.20			
		2502.5	18.45	18.89	18.57			
	12RB_0	2567.5	18.34	18.35	18.12			
		2535.0	18.42	18.46	18.18			
		2502.5	18.27	18.73	18.42			
	25RB_0	2567.5	18.40	18.28	18.05			
		2535.0	18.38	18.44	18.16			
		2502.5	18.33	18.60	18.51			



Power Level B1								
LTE Band 7			Actual output Power (dBm)			Tune up		
Band -width	RB No. / RB offset	Frequency (MHz)	Modulation			Modulation		
			QPSK	16QAM	64QAM	QPSK	16QAM	64QAM
10 MHz	1RB_49	2565.0	19.26	18.91	18.47	20.5	19.5	19.5
		2535.0	19.69	19.37	19.05			
		2505.0	19.33	18.96	18.69			
	1RB_24	2565.0	19.33	18.95	18.53			
		2535.0	19.30	18.93	18.60			
		2505.0	19.27	18.76	18.56			
	1RB_0	2565.0	19.31	18.92	18.40			
		2535.0	19.26	18.90	18.55			
		2505.0	19.21	18.82	18.51			
	25RB_25	2565.0	18.41	18.58	18.32	19.5	19.5	19.5
		2535.0	18.36	18.64	18.36			
		2505.0	18.43	19.18	18.90			
	25RB_12	2565.0	18.44	18.65	18.39			
		2535.0	18.46	18.56	18.27			
		2505.0	18.31	18.99	18.71			
	25RB_0	2565.0	18.46	18.80	18.51			
		2535.0	18.31	18.64	18.37			
		2505.0	18.28	18.87	18.59			
	50RB_0	2565.0	18.49	18.72	18.45			
		2535.0	18.34	18.69	18.39			
		2505.0	18.37	18.83	18.76			



Power Level B1								
LTE Band 7			Actual output Power (dBm)			Tune up		
Band -width	RB No. / RB offset	Frequency (MHz)	Modulation			Modulation		
			QPSK	16QAM	64QAM	QPSK	16QAM	64QAM
15 MHz	1RB_74	2562.5	19.26	19.11	18.59	20.5	19.5	19.5
		2535.0	19.21	18.90	18.69			
		2507.5	19.36	18.80	18.67			
	1RB_37	2562.5	19.26	19.04	18.59			
		2535.0	19.34	18.99	18.70			
		2507.5	19.27	18.75	18.55			
	1RB_0	2562.5	19.19	19.00	18.44			
		2535.0	19.17	18.82	18.63			
		2507.5	19.17	18.58	18.47			
	36RB_38	2562.5	18.43	18.48	18.39	19.5	19.5	19.5
		2535.0	18.83	18.52	18.15			
		2507.5	18.43	18.88	18.77			
	36RB_19	2562.5	18.40	18.71	18.60			
		2535.0	18.45	18.57	18.21			
		2507.5	18.37	18.80	18.69			
	36RB_0	2562.5	18.39	18.94	18.73			
		2535.0	18.38	18.81	18.46			
		2507.5	18.37	18.83	18.71			
	75RB_0	2562.5	18.54	18.74	18.39			
		2535.0	18.36	18.69	18.35			
		2507.5	18.33	18.88	18.77			



Power Level B1								
LTE Band 7			Actual output Power (dBm)			Tune up		
Band -width	RB No. / RB offset	Frequency (MHz)	Modulation			Modulation		
			QPSK	16QAM	64QAM	QPSK	16QAM	64QAM
20 MHz	1RB_99	2560.0	19.45	18.70	18.54	20.5	19.5	19.5
		2535.0	19.44	18.89	18.45			
		2510.0	19.20	19.04	18.52			
	1RB_50	2560.0	19.34	18.61	18.56			
		2535.0	19.41	18.78	18.32			
		2510.0	19.42	18.96	18.44			
	1RB_0	2560.0	19.18	18.51	18.50			
		2535.0	19.32	18.72	18.19			
		2510.0	19.21	18.83	18.30			
	50RB_50	2560.0	18.90	18.64	18.64	19.5	19.5	19.5
		2535.0	18.85	18.61	18.63			
		2510.0	18.55	19.06	18.95			
	50RB_25	2560.0	18.37	18.69	18.68			
		2535.0	18.51	18.40	18.41			
		2510.0	18.31	18.84	18.69			
	50RB_0	2560.0	18.41	18.76	18.80			
		2535.0	18.44	18.61	18.63			
		2510.0	18.45	18.68	18.63			
	100RB_0	2560.0	18.39	18.73	18.72			
		2535.0	18.56	18.61	18.64			
		2510.0	18.44	18.75	18.78			



Power Level A1/B1								
LTE Band 13			Actual output Power (dBm)			Tune up		
Band -width	RB No. / RB offset	Frequency (MHz)	Modulation			Modulation		
			QPSK	16QAM	64QAM	QPSK	16QAM	64QAM
5 MHz	1RB_24	784.5	23.25	22.62	22.47	24.5	23.5	23.5
		782.0	23.38	22.06	22.21			
		779.5	23.35	22.05	22.41			
	1RB_12	784.5	23.35	22.42	22.26			
		782.0	23.25	22.09	22.59			
		779.5	23.38	22.26	22.56			
	1RB_0	784.5	23.33	22.60	22.48			
		782.0	23.46	22.31	22.64			
		779.5	23.35	22.28	22.46			
	12RB_13	784.5	22.25	21.46	21.56	23.5	22.5	22.5
		782.0	22.02	21.48	21.48			
		779.5	22.40	21.39	21.64			
	12RB_6	784.5	21.97	21.38	21.48			
		782.0	22.15	21.26	21.32			
		779.5	22.41	21.43	21.60			
	12RB_0	784.5	22.20	21.42	21.43			
		782.0	22.44	21.52	21.58			
		779.5	22.40	21.52	21.62			
	25RB_0	784.5	22.08	21.28	21.50			
		782.0	22.32	21.45	21.44			
		779.5	22.39	21.58	21.53			



Power Level A1/B1								
LTE Band 13			Actual output Power (dBm)			Tune up		
Band -width	RB No. / RB offset	Frequency (MHz)	Modulation			Modulation		
			QPSK	16QAM	64QAM	QPSK	16QAM	64QAM
10 MHz	1RB_49	782.0	23.23	22.28	22.55	24.5	23.5	23.5
	1RB_24	782.0	23.25	22.03	22.46			
	1RB_0	782.0	23.45	22.19	22.56			
	25RB_25	782.0	22.10	21.64	21.45	23.5	22.5	22.5
	25RB_12	782.0	22.34	21.42	21.41			
	25RB_0	782.0	22.26	21.56	21.52			
	50RB_0	782.0	22.11	21.24	21.35			

10.4. Bluetooth Measurement result

Table 10.5: The conducted Power measurement results for Bluetooth

Averaged Power (dBm)				
Mode	Tune up	Ch.0 (2402MHz)	Ch.39 (2441MHz)	Ch.78 (2480MHz)
GFSK	11.0	10.12	9.74	9.67
EDR2M-4_DQPSK	12.0	10.87	10.83	10.77
EDR3M-8DPSK	12.0	10.94	10.92	10.85

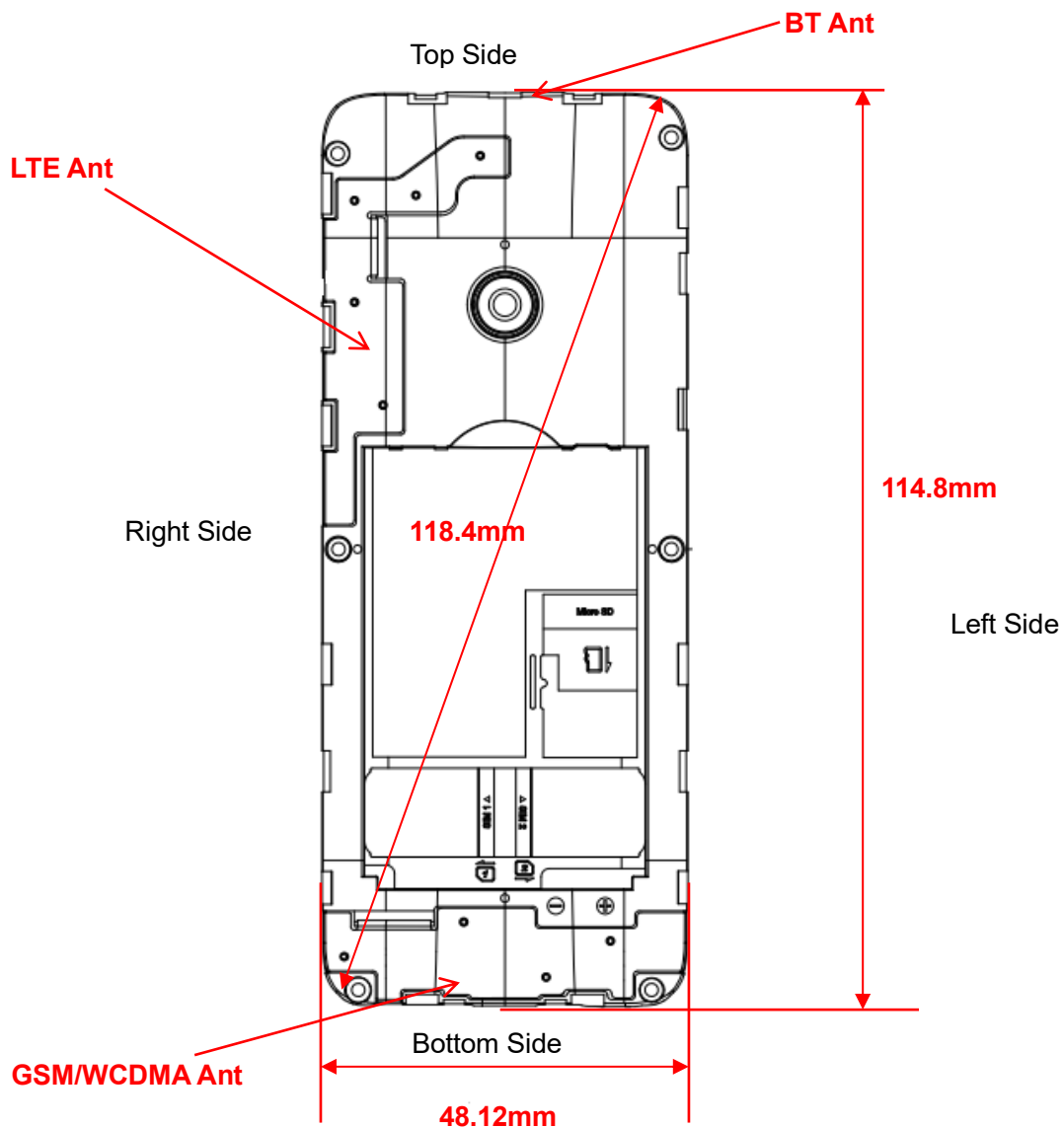
11. Simultaneous TX SAR Considerations

11.1. Introduction

The following procedures adopted from “FCC SAR Considerations for Cell Phones with Multiple Transmitters” are applicable to handsets with built-in unlicensed transmitters such as Bluetooth devices which may simultaneously transmit with the licensed transmitter.

For this device, the Bluetooth can transmit simultaneous with other transmitters.

11.2. Transmit Antenna Separation Distances



Picture 11.1 Antenna Locations (Back View)

12. Evaluation of Simultaneous

No.	Simultaneous Transmission Configuration
01	WWAN + Bluetooth

Table 12.1: Maximum Simultaneous Transmission SAR

/	Position	Sum (W/kg)
Highest reported SAR value for Head	Left Cheek (GSM850 + Bluetooth)	1.34
Highest reported SAR value for Body-worn	Rear Side (LTE Band 4 + Bluetooth)	1.12

Note: the test positions of above tables are for the worse case that has been evaluated.

Conclusion:

According to the above tables, the sum of reported SAR values is less than limit. So the simultaneous transmission SAR with volume scans is not required.

13. Summary of Test Results

The calculated SAR is obtained by the following formula:

$$\text{Reported SAR} = \text{Measured SAR} \times 10^{(P_{\text{Target}} - P_{\text{Measured}})/10}$$

Where P_{Target} is the power of manufacturing upper limit;

P_{Measured} is the measured power in chapter 10.

Duty Cycle

Mode	Duty Cycle
Speech for GSM	1:8.3
GPRS	1:2.67/1:4
WCDMA	1:1
FDD_LTE	1:1
Bluetooth	1:1

13.1. Testing Environment

Temperature:	18°C~25°C
Relative humidity:	30%~70%
Ambient noise & Reflection:	< 0.012 W/kg

13.2. Test Results

Table 13.1: SAR Values (GSM 850 - Head)

Frequency		Test Mode	Test Position	Figure No./ Note	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift(dB)
Ch.	MHz								
Power Level A1									
190	836.6	Speech	Left Cheek	/	31.86	33.0	0.799	1.04	-0.04
190	836.6	Speech	Left Tilt	/	31.86	33.0	0.387	0.50	-0.09
190	836.6	Speech	Right Cheek	1	31.86	33.0	0.991	1.29	-0.02
190	836.6	Speech	Right Tilt	/	31.86	33.0	0.547	0.71	-0.03
251	848.8	Speech	Left Cheek	/	31.74	33.0	0.734	0.98	0.02
128	824.2	Speech	Left Cheek	/	31.97	33.0	0.752	0.95	0.04
251	848.8	Speech	Right Cheek	/	31.74	33.0	0.910	1.22	-0.15
128	824.2	Speech	Right Cheek	/	31.97	33.0	0.933	1.18	-0.06

Table 13.2: SAR Values (GSM 850 - Body)

Frequency		Test Mode	Test Position	Figure No./ Note	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift(dB)
Ch.	MHz								
Body-Worn Test Data (15mm) - Power Level B1									
190	836.6	GPRS-3	Front	/	28.60	29.5	0.429	0.53	0.01
190	836.6	GPRS-3	Rear	2	28.60	29.5	0.615	0.76	0.16

Table 13.3: SAR Values (GSM 1900 - Head)

Frequency		Test Mode	Test Position	Figure No./ Note	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift(dB)
Ch.	MHz								
Power Level A1									
661	1880.0	Speech	Left Cheek	3	28.76	30.0	0.349	0.46	-0.04
661	1880.0	Speech	Left Tilt	/	28.76	30.0	0.163	0.22	-0.08
661	1880.0	Speech	Right Cheek	/	28.76	30.0	0.335	0.45	0.05
661	1880.0	Speech	Right Tilt	/	28.76	30.0	0.191	0.25	-0.04

Table 13.4: SAR Values (GSM 1900 - Body)

Frequency		Test Mode	Test Position	Figure No./ Note	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift(dB)
Ch.	MHz								
Body-Worn Test Data (15mm) - Power Level B1									
661	1880.0	GPRS-2	Front	/	25.18	26.0	0.180	0.22	0.03
661	1880.0	GPRS-2	Rear	4	25.18	26.0	0.216	0.26	0.04

Table 13.5: SAR Values (WCDMA Band 2 - Head)

Frequency		Test Mode	Test Position	Figure No./ Note	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift(dB)
Ch.	MHz								
Power Level A1									
9400	1880.0	RMC	Left Cheek	/	22.60	24.0	0.349	0.48	-0.08
9400	1880.0	RMC	Left Tilt	/	22.60	24.0	0.157	0.22	0.04
9400	1880.0	RMC	Right Cheek	5	22.60	24.0	0.429	0.59	0.04
9400	1880.0	RMC	Right Tilt	/	22.60	24.0	0.189	0.26	-0.12

Table 13.6: SAR Values (WCDMA Band 2 - Body)

Frequency		Test Mode	Test Position	Figure No./ Note	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift(dB)
Ch.	MHz								
Body-Worn Test Data (15mm) - Power Level B1									
9400	1880.0	RMC	Front	/	21.00	22.0	0.134	0.17	0.11
9400	1880.0	RMC	Rear	6	21.00	22.0	0.338	0.43	0.06

Table 13.7: SAR Values (WCDMA Band 4 - Head)

Frequency		Test Mode	Test Position	Figure No./ Note	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift(dB)
Ch.	MHz								
Power Level A1									
1413	1732.6	RMC	Left Cheek	/	23.10	24.0	0.480	0.59	0.08
1413	1732.6	RMC	Left Tilt	/	23.10	24.0	0.337	0.41	0.03
1413	1732.6	RMC	Right Cheek	7	23.10	24.0	0.549	0.68	-0.09
1413	1732.6	RMC	Right Tilt	/	23.10	24.0	0.391	0.48	0.16

Table 13.8: SAR Values (WCDMA Band 4 - Body)

Frequency		Test Mode	Test Position	Figure No./ Note	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift(dB)
Ch.	MHz								
Body-Worn Test Data (15mm) - Power Level B1									
1413	1732.6	RMC	Front	/	23.10	24.0	0.030	0.04	0.02
1413	1732.6	RMC	Rear	8	23.10	24.0	0.079	0.10	0.07

Table 13.1: SAR Values (WCDMA Band 5 - Head)

Frequency		Test Mode	Test Position	Figure No./ Note	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift(dB)
Ch.	MHz								
Power Level A1									
4183	836.6	RMC	Left Cheek	/	23.00	24.0	0.729	0.92	0.03
4183	836.6	RMC	Left Tilt	/	23.00	24.0	0.439	0.55	-0.04
4183	836.6	RMC	Right Cheek	/	23.00	24.0	0.642	0.81	0.03
4183	836.6	RMC	Right Tilt	/	23.00	24.0	0.414	0.52	0.08
4233	846.6	RMC	Left Cheek	/	23.00	24.0	0.705	0.89	0.08
4132	826.4	RMC	Left Cheek	9	23.00	24.0	0.757	0.95	0.04
4233	846.6	RMC	Right Cheek	/	23.00	24.0	0.621	0.78	0.11
4132	826.4	RMC	Right Cheek	/	23.00	24.0	0.667	0.84	0.09

Table 13.2: SAR Values (WCDMA Band 5 - Body)

Frequency		Test Mode	Test Position	Figure No./ Note	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift(dB)
Ch.	MHz								
Body-Worn Test Data (15mm) - Power Level B1									
4183	836.6	RMC	Front	/	23.00	24.0	0.446	0.56	0.16
4183	836.6	RMC	Rear	10	23.00	24.0	0.611	0.77	0.04

Table 13.1: SAR Values (LTE Band 2 - Head)

Frequency		Test Mode	Test Position	Figure No./ Note	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift(dB)
Ch.	MHz								
Power Level A1									
18700	1860.0	1RB0	Left Cheek	/	23.23	24.0	0.141	0.17	0.03
18700	1860.0	50RB0	Left Cheek	/	21.71	23.0	0.108	0.15	0.12
18700	1860.0	1RB0	Left Tilt	/	23.23	24.0	0.072	0.09	0.04
18700	1860.0	50RB0	Left Tilt	/	21.71	23.0	0.054	0.07	0.03
18700	1860.0	1RB0	Right Cheek	11	23.23	24.0	0.158	0.19	0.01
18700	1860.0	50RB0	Right Cheek	/	21.71	23.0	0.119	0.16	0.12
18700	1860.0	1RB0	Right Tilt	/	23.23	24.0	0.075	0.09	0.04
18700	1860.0	50RB0	Right Tilt	/	21.71	23.0	0.057	0.08	0.03

Table 13.2: SAR Values (LTE Band 2 - Body)

Frequency		Test Mode	Test Position	Figure No./ Note	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift(dB)
Ch.	MHz								
Body-Worn Test Data (15mm) - Power Level B1									
18700	1860.0	1RB0	Front	/	20.09	21.0	0.115	0.14	0.16
18700	1860.0	50RB0	Front	/	18.97	20.0	0.095	0.12	-0.05
18700	1860.0	1RB0	Rear	12	20.09	21.0	0.275	0.34	0.10
18700	1860.0	50RB0	Rear	/	18.97	20.0	0.213	0.27	-0.08

Table 13.3: SAR Values (LTE Band 4 - Head)

Frequency		Test Mode	Test Position	Figure No./ Note	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift(dB)
Ch.	MHz								
Power Level A1									
20300	1745.0	1RB99	Left Cheek	/	21.47	22.5	0.771	0.98	0.04
20300	1745.0	50RB25	Left Cheek	/	20.48	21.5	0.527	0.67	-0.01
20300	1745.0	1RB99	Left Tilt	/	21.47	22.5	0.306	0.39	-0.08
20300	1745.0	50RB25	Left Tilt	/	20.48	21.5	0.211	0.27	0.12
20300	1745.0	1RB99	Right Cheek	13	21.47	22.5	0.900	1.14	0.03
20300	1745.0	50RB25	Right Cheek	/	20.48	21.5	0.634	0.80	-0.18
20300	1745.0	1RB99	Right Tilt	/	21.47	22.5	0.289	0.37	-0.09
20300	1745.0	50RB25	Right Tilt	/	20.48	21.5	0.224	0.28	-0.15
20175	1732.5	1RB99	Left Cheek	/	21.38	22.5	0.664	0.86	0.13
20050	1720.0	1RB99	Left Cheek	/	21.36	22.5	0.624	0.81	-0.14
20175	1732.5	1RB99	Right Cheek	/	21.38	22.5	0.775	1.00	0.09
20050	1720.0	1RB99	Right Cheek	/	21.36	22.5	0.728	0.95	0.14
20175	1732.5	50RB25	Right Cheek	/	20.45	21.5	0.580	0.74	0.08
20050	1720.0	50RB25	Right Cheek	/	20.39	21.5	0.526	0.68	-0.05
20300	1745.0	100RB	Right Cheek	/	20.47	21.5	0.622	0.79	-0.17

Table 13.4: SAR Values (LTE Band 4 - Body)

Frequency		Test Mode	Test Position	Figure No./ Note	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift(dB)
Ch.	MHz								
Body-Worn Test Data (15mm) - Power Level B1									
20300	1745.0	1RB99	Front	/	21.47	22.5	0.560	0.71	0.16
20300	1745.0	50RB25	Front	/	20.48	21.5	0.356	0.45	-0.02
20300	1745.0	1RB99	Rear	14	21.47	22.5	0.883	1.12	-0.18
20300	1745.0	50RB25	Rear	/	20.48	21.5	0.659	0.83	0.12
20175	1732.5	1RB99	Rear	/	21.38	22.5	0.788	1.02	0.15
20050	1720.0	1RB99	Rear	/	21.36	22.5	0.750	0.98	0.12
20175	1732.5	50RB25	Rear	/	20.45	21.5	0.595	0.76	0.03
20050	1720.0	50RB25	Rear	/	20.39	21.5	0.546	0.71	0.12
20300	1745.0	100RB	Rear	/	20.47	21.5	0.651	0.83	0.03

Table 13.5: SAR Values (LTE Band 5 - Head)

Frequency		Test Mode	Test Position	Figure No./ Note	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift(dB)
Ch.	MHz								
Power Level A1									
20525	836.5	1RB49	Left Cheek	15	23.45	24.5	0.967	1.23	-0.04
20450	829.0	25RB12	Left Cheek	/	22.46	23.5	0.777	0.99	0.02
20525	836.5	1RB49	Left Tilt	/	23.45	24.5	0.660	0.84	0.01
20450	829.0	25RB12	Left Tilt	/	22.46	23.5	0.475	0.60	0.08
20525	836.5	1RB49	Right Cheek	/	23.45	24.5	0.771	0.98	-0.12
20450	829.0	25RB12	Right Cheek	/	22.46	23.5	0.629	0.80	-0.02
20525	836.5	1RB49	Right Tilt	/	23.45	24.5	0.544	0.69	0.09
20450	829.0	25RB12	Right Tilt	/	22.46	23.5	0.400	0.51	0.12
20600	844.0	1RB49	Left Cheek	/	23.37	24.5	0.958	1.24	-0.14
20450	829.0	1RB49	Left Cheek	/	23.33	24.5	0.945	1.24	0.04
20600	844.0	25RB12	Left Cheek	/	22.40	23.5	0.734	0.95	-0.05
20525	836.5	25RB12	Left Cheek	/	22.32	23.5	0.766	1.01	0.14
20600	844.0	50RB0	Left Cheek	/	22.43	23.5	0.733	0.94	0.15
20600	844.0	1RB49	Left Tilt	/	23.37	24.5	0.639	0.83	0.08
20450	829.0	1RB49	Left Tilt	/	23.33	24.5	0.620	0.81	0.02
20600	844.0	1RB49	Right Cheek	/	23.37	24.5	0.764	0.99	0.05
20450	829.0	1RB49	Right Cheek	/	23.33	24.5	0.753	0.99	0.01
20600	844.0	25RB12	Right Cheek	/	22.40	23.5	0.585	0.75	0.13
20525	836.5	25RB12	Right Cheek	/	22.32	23.5	0.611	0.80	-0.11

Table 13.6: SAR Values (LTE Band 5 - Body)

Frequency		Test Mode	Test Position	Figure No./ Note	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift(dB)
Ch.	MHz								
Body-Worn Test Data (15mm) - Power Level B1									
20525	836.5	1RB49	Front	/	23.45	24.5	0.552	0.70	0.09
20450	829.0	25RB12	Front	/	22.46	23.5	0.411	0.52	0.07
20525	836.5	1RB49	Rear	16	23.45	24.5	0.800	1.02	0.08
20450	829.0	25RB12	Rear	/	22.46	23.5	0.636	0.81	-0.06
20600	844.0	1RB49	Rear	/	23.37	24.5	0.738	0.96	0.04
20450	829.0	1RB49	Rear	/	23.33	24.5	0.779	1.02	0.02
20600	844.0	25RB12	Rear	/	22.40	23.5	0.630	0.81	0.01
20525	836.5	25RB12	Rear	/	22.32	23.5	0.641	0.84	0.04
20600	844.0	50RB	Rear	/	22.43	23.5	0.622	0.80	0.01

Table 13.7: SAR Values (LTE Band 7 - Head)

Frequency		Test Mode	Test Position	Figure No./ Note	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift(dB)
Ch.	MHz								
Power Level A1									
21350	2560.0	1RB99	Left Cheek	17	22.42	23.5	0.438	0.56	0.01
21350	2560.0	50RB50	Left Cheek	/	21.50	22.5	0.347	0.44	0.04
21350	2560.0	1RB99	Left Tilt	/	22.42	23.5	0.078	0.10	0.02
21350	2560.0	50RB50	Left Tilt	/	21.50	22.5	0.062	0.08	0.07
21350	2560.0	1RB99	Right Cheek	/	22.42	23.5	0.426	0.55	0.16
21350	2560.0	50RB50	Right Cheek	/	21.50	22.5	0.318	0.40	-0.07
21350	2560.0	1RB99	Right Tilt	/	22.42	23.5	0.073	0.09	-0.07
21350	2560.0	50RB50	Right Tilt	/	21.50	22.5	0.057	0.07	0.14

Table 13.8: SAR Values (LTE Band 7 - Body)

Frequency		Test Mode	Test Position	Figure No./ Note	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift(dB)
Ch.	MHz								
Body-Worn Test Data (15mm) - Power Level B1									
21350	2560.0	1RB99	Front	18	19.45	20.5	0.236	0.30	0.15
21350	2560.0	50RB50	Front	/	18.90	19.5	0.185	0.21	0.05
21350	2560.0	1RB99	Rear	/	19.45	20.5	0.137	0.17	0.06
21350	2560.0	50RB50	Rear	/	18.90	19.5	0.102	0.12	0.01

Table 13.9: SAR Values (LTE Band 13 - Head)

Frequency		Test Mode	Test Position	Figure No./ Note	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift(dB)
Ch.	MHz								
Power Level A1									
23230	782.0	1RB0	Left Cheek	19	23.45	24.5	0.367	0.47	0.03
23230	782.0	25RB12	Left Cheek	/	22.34	23.5	0.273	0.36	0.06
23230	782.0	1RB0	Left Tilt	/	23.45	24.5	0.229	0.29	-0.08
23230	782.0	25RB12	Left Tilt	/	22.34	23.5	0.173	0.23	0.03
23230	782.0	1RB0	Right Cheek	/	23.45	24.5	0.300	0.38	-0.03
23230	782.0	25RB12	Right Cheek	/	22.34	23.5	0.220	0.29	0.08
23230	782.0	1RB0	Right Tilt	/	23.45	24.5	0.192	0.24	0.07
23230	782.0	25RB12	Right Tilt	/	22.34	23.5	0.144	0.19	0.02

Table 13.10: SAR Values (LTE Band 13 - Body)

Frequency		Test Mode	Test Position	Figure No./ Note	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift(dB)
Ch.	MHz								
Body-Worn Test Data (15mm) - Power Level B1									
23230	782.0	1RB0	Front	/	23.45	24.5	0.194	0.25	-0.01
23230	782.0	25RB12	Front	/	22.34	23.5	0.152	0.20	-0.18
23230	782.0	1RB0	Rear	20	23.45	24.5	0.349	0.44	0.06
23230	782.0	25RB12	Rear	/	22.34	23.5	0.275	0.36	-0.05

Table 13.11: SAR Values (Bluetooth - Head)

Frequency		Test Mode	Test Position	Figure No./ Note	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift(dB)
Ch.	MHz								
0	2402.0	8DPSK	Left Cheek	/	10.94	12.0	0.027	0.03	0.18
0	2402.0	8DPSK	Left Tilt	/	10.94	12.0	0.024	0.03	0.03
0	2402.0	8DPSK	Right Cheek	21	10.94	12.0	0.037	0.05	0.16
0	2402.0	8DPSK	Right Tilt	/	10.94	12.0	0.027	0.03	-0.09

Table 13.12: SAR Values (Bluetooth - Body)

Frequency		Test Mode	Test Position	Figure No./ Note	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift(dB)
Ch.	MHz								
Body-Worn Test Data (15mm)									
0	2402.0	8DPSK	Front	/	10.94	12.0	0.002	<0.01	0.09
0	2402.0	8DPSK	Rear	22	10.94	12.0	0.002	<0.01	0.10

14. SAR Measurement Variability

SAR measurement variability must be assessed for each frequency band, which is determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. When both head and body tissue-equivalent media are required for SAR measurements in a frequency band, the variability measurement procedures should be applied to the tissue medium with the highest measured SAR, using the highest measured SAR configuration for that tissue-equivalent medium.

The following procedures are applied to determine if repeated measurements are required.

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

Table 14.1: SAR Measurement Variability for Head - GSM850

Frequency		Test Position	Original	1 st Repeated	Ratio	2 nd Repeated
Ch.	MHz		SAR (W/kg)	SAR (W/kg)		SAR (W/kg)
190	836.6	Right Cheek	0.991	0.974	1.02	/

Table 14.2: SAR Measurement Variability for Head - LTE Band 4

Frequency		Test Position	Original	1 st Repeated	Ratio	2 nd Repeated
Ch.	MHz		SAR (W/kg)	SAR (W/kg)		SAR (W/kg)
20300	1745.0	Right Cheek	0.900	0.881	1.02	/

Table 14.3: SAR Measurement Variability for Body - LTE Band 4

Frequency		Test Position	Original	1 st Repeated	Ratio	2 nd Repeated
Ch.	MHz		SAR (W/kg)	SAR (W/kg)		SAR (W/kg)
20300	1745.0	Rear	0.883	0.869	1.02	/

Table 14.4: SAR Measurement Variability for Head - LTE Band 5

Frequency		Test Position	Original	1 st Repeated	Ratio	2 nd Repeated
Ch.	MHz		SAR (W/kg)	SAR (W/kg)		SAR (W/kg)
20525	836.5	Left Cheek	0.967	0.952	1.02	/

Table 14.5: SAR Measurement Variability for Body - LTE Band 5

Frequency		Test Position	Original	1 st Repeated	Ratio	2 nd Repeated
Ch.	MHz		SAR (W/kg)	SAR (W/kg)		SAR (W/kg)
20525	836.5	Rear	0.800	0.783	1.02	/

15. Measurement Uncertainty

15.1. Measurement Uncertainty for Normal SAR Tests (300MHz~3GHz)

No.	Error Description	Type	Uncertainty value	Probably Distribution	Div.	(Ci) 1g	(Ci) 10g	Std. Unc. (1g)	Std. Unc. (10g)	Degree of freedom
Measurement system										
1	Probe calibration	B	12.7	N	2	1	1	6.35	6.35	∞
2	Axial isotropy	B	4.7	R	√3	√0.5	√0.5	4.3	4.3	∞
3	Hemispherical isotropy	B	9.6	R	√3	1	1	4.8	4.8	∞
4	Boundary effect	B	1.1	R	√3	1	1	0.6	0.6	∞
5	Linearity	B	4.7	R	√3	1	1	2.7	2.7	∞
6	Detection limit	B	1.0	R	√3	1	1	0.6	0.6	∞
7	Modulation response	B	4.0	R	√3	1	1	2.3	2.3	∞
8	Readout electronics	B	1.0	N	1	1	1	1.0	1.0	∞
9	Response time	B	0.8	R	√3	1	1	0.5	0.5	∞
10	Integration time	B	1.7	R	√3	1	1	1.0	1.0	∞
11	RF ambient conditions-noise	B	3.0	R	√3	1	1	1.7	1.7	∞
12	RF ambient conditions-reflection	B	3.0	R	√3	1	1	1.7	1.7	∞
13	Probe positioned mech. restrictions	B	0.35	R	√3	1	1	0.2	0.2	∞
14	Probe positioning with respect to phantom shell	B	2.9	R	√3	1	1	1.7	1.7	∞
15	Post-processing	B	1.0	R	√3	1	1	0.6	0.6	∞
Test sample related										
16	Test sample positioning	A	3.3	N	1	1	1	3.3	3.3	5
17	Device holder uncertainty	A	3.4	N	1	1	1	3.4	3.4	5
18	Power scaling	B	0	R	√3	1	1	0	0	∞
19	Drift of output power	B	5.0	R	√3	1	1	2.9	2.9	∞
Phantom and set-up										
20	Phantom uncertainty	B	1.0	R	√3	1	1	0.6	0.6	∞
21	Algorithm for correcting SAR for deviations in permittivity and conductivity	B	1.9	N	1	1	0.84	1.9	1.6	∞
22	Liquid conductivity (target)	B	5.0	R	√3	0.64	0.43	1.8	1.2	∞
23	Liquid conductivity (meas.)	A	1.3	N	1	0.64	0.43	0.83	0.56	9
24	Liquid permittivity (target)	B	5.0	R	√3	0.6	0.49	1.7	1.4	∞
25	Liquid permittivity (meas.)	A	1.6	N	1	0.6	0.49	0.96	0.78	9
Combined standard uncertainty			$u'_c = \sqrt{\sum_{i=1}^{23} c_i^2 u_i^2}$					11.6	11.4	95.5
Expanded uncertainty (Confidence interval of 95 %)			$u_e = 2u_c$					23.2	22.8	

16. Main Test Instruments

Table 16.1: List of Main Instruments

No.	Name	Type	Serial Number	Calibration Date	Valid Period
01	Network analyzer	E5071C	MY46103759	2022-11-14	One year
02	Dielectric probe	85070E	MY44300317	/	/
03	Power meter	E4418B	MY50000366	2022-12-11	One year
04	Power sensor	E9304A	MY50000188	2022-12-11	One year
05	Power meter	NRP	101260	2021-12-30	One year
06	Power sensor	NRP-Z91	102211	2021-12-30	One year
07	Signal Generator	E8257D	MY47461211	2023-01-13	One year
08	Amplifier	VTL5400	0404	/	/
09	DAE	DAE4	1527	2022-06-21	One year
10	E-field Probe	EX3DV4	7621	2022-05-06	One year
11	DAE	DAE4	1790	2023-03-02	One year
12	E-field Probe	EX3DV4	7683	2023-02-16	One year
13	Dipole Validation Kit	D750V3	1163	2022-08-22	Three years
14	Dipole Validation Kit	D835V2	4d057	2021-10-18	Three years
15	Dipole Validation Kit	D1750V2	1152	2022-08-22	Three years
16	Dipole Validation Kit	D1900V2	5d088	2021-10-18	Three years
17	Dipole Validation Kit	D2450V2	873	2021-10-21	Three years
18	Dipole Validation Kit	D2550V2	1010	2021-05-21	Three years
19	BTS	E5515C	GB46110722	2023-01-13	One year
20	BTS	MT8820C	6201341853	2023-03-23	One year
21	BTS	CMW500	152499	2023-07-14	One year
22	Software	DASY5	/	/	/

ANNEX A: Graph Results

GSM850 Head

Date: 2022-12-25

Electronics: DAE4 Sn1527

Medium: Head 835MHz

Medium parameters used (interpolated): $f = 836.6$ MHz; $\sigma = 0.918$ S/m; $\epsilon_r = 40.466$; $\rho = 1000$ kg/m³

Communication System: UID 0, GSM (0) Frequency: 836.6 MHz Duty Cycle: 1:8.3

Probe: EX3DV4 - SN7621 ConvF (11.12, 11.12, 11.12)

Right Cheek Middle/Area Scan (51x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.25 W/kg

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

Reference Value = 14.77 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 1.40 W/kg

SAR(1 g) = 0.991 W/kg; SAR(10 g) = 0.709 W/kg

Maximum value of SAR (measured) = 1.24 W/kg

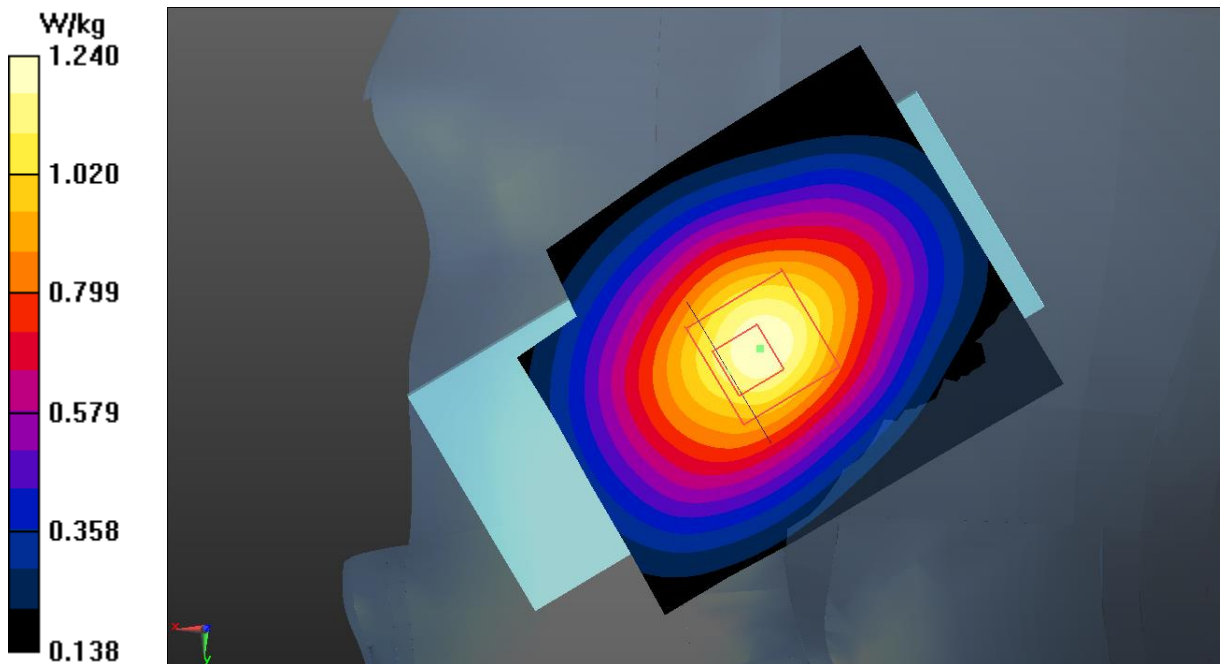


Fig.1 GSM850 Head

GSM850 Body

Date: 2022-12-25

Electronics: DAE4 Sn1527

Medium: Head 835MHz

Medium parameters used (interpolated): $f = 836.6$ MHz; $\sigma = 0.918$ S/m; $\epsilon_r = 40.466$; $\rho = 1000$ kg/m³

Communication System: UID 0, 3 slot GPRS (0) Frequency: 836.6 MHz Duty Cycle: 1:2.67

Probe: EX3DV4 - SN7621 ConvF (11.12, 11.12, 11.12)

Rear Side Middle/Area Scan (51x71x1): Interpolated grid: $dx=1.500$ mm, $dy=1.500$ mm

Maximum value of SAR (interpolated) = 0.735 W/kg

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

Reference Value = 21.90 V/m; Power Drift = 0.16 dB

Peak SAR (extrapolated) = 0.846 W/kg

SAR(1 g) = 0.615 W/kg; SAR(10 g) = 0.434 W/kg

Maximum value of SAR (measured) = 0.744 W/kg

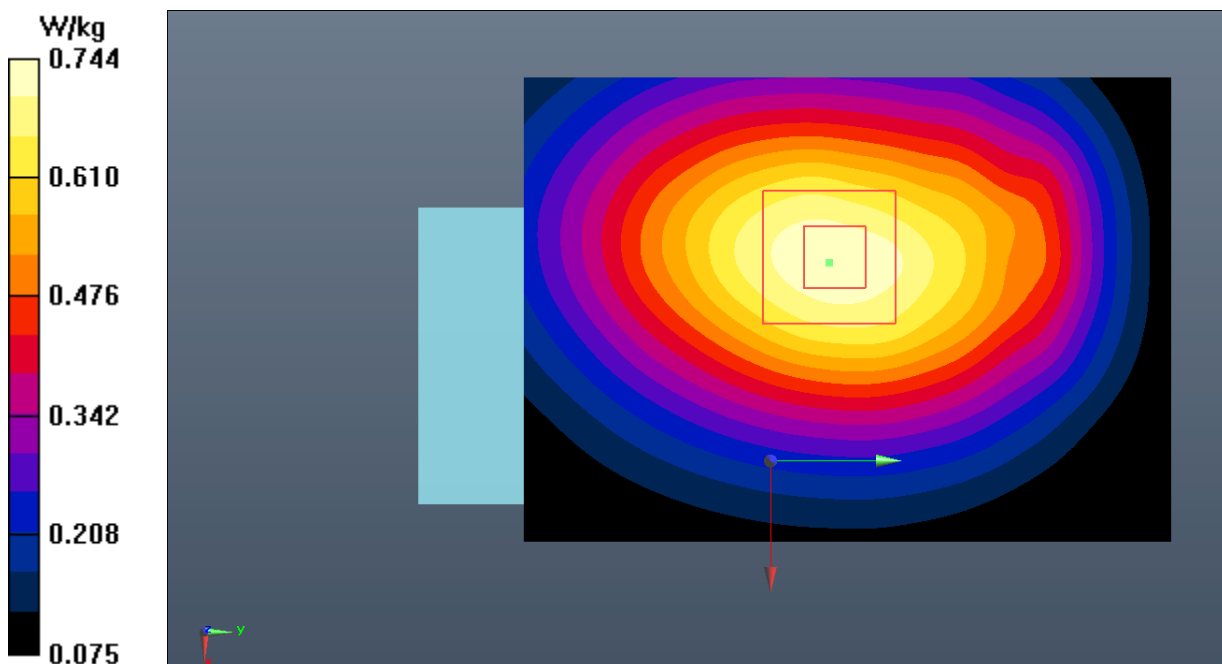


Fig.2 GSM850 Body

GSM1900 Head

Date: 2022-12-26

Electronics: DAE4 Sn1527

Medium: Head 1900MHz

Medium parameters used: $f = 1880$ MHz; $\sigma = 1.407$ S/m; $\epsilon_r = 38.767$; $\rho = 1000$ kg/m³

Communication System: UID 0, GSM (0) Frequency: 1880 MHz Duty Cycle: 1:8.3

Probe: EX3DV4 - SN7621 ConvF (8.90, 8.90, 8.90)

Left Cheek Middle/Area Scan (51x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.429 W/kg

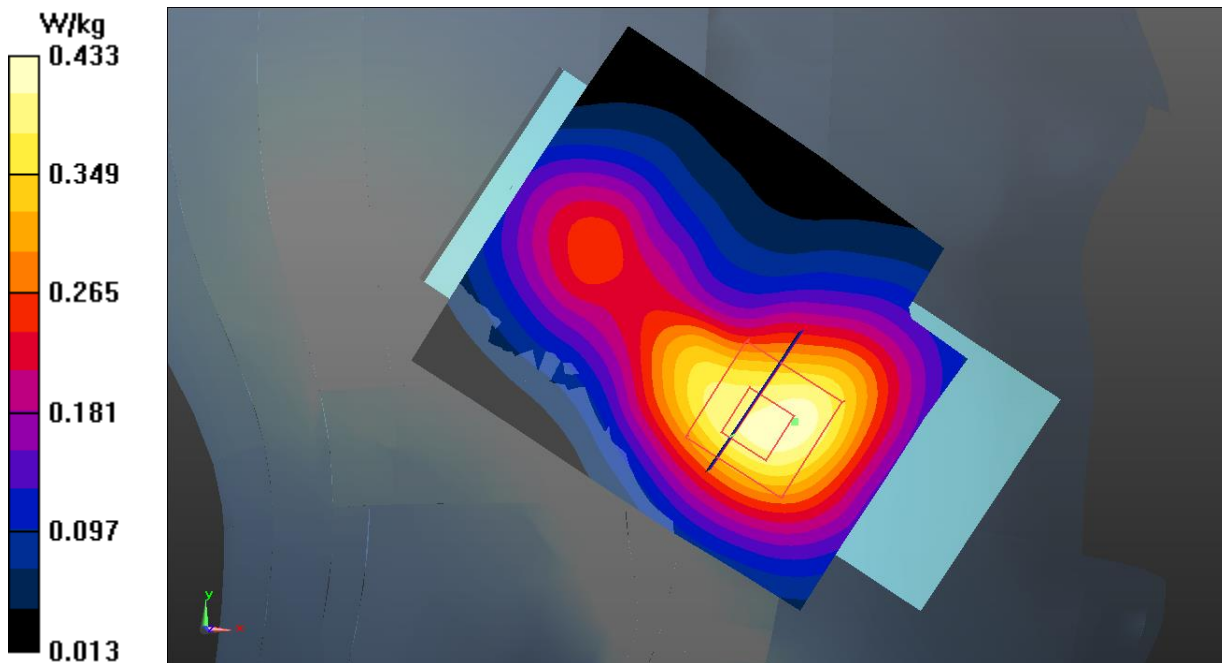
Left Cheek Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 9.449 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 0.528 W/kg

SAR(1 g) = 0.349 W/kg; SAR(10 g) = 0.220 W/kg

Maximum value of SAR (measured) = 0.433 W/kg

**Fig.3 GSM1900 Head**

GSM1900 Body

Date: 2022-12-26

Electronics: DAE4 Sn1527

Medium: Head 1900MHz

Medium parameters used: $f = 1880$ MHz; $\sigma = 1.407$ S/m; $\epsilon_r = 38.767$; $\rho = 1000$ kg/m³

Communication System: UID 0, 4 slot GPRS (0) Frequency: 1880 MHz Duty Cycle: 1:2

Probe: EX3DV4 - SN7621 ConvF (8.90, 8.90, 8.90)

Rear Side Middle/Area Scan (61x111x1): Interpolated grid: $dx=1.500$ mm, $dy=1.500$ mm

Maximum value of SAR (interpolated) = 0.287 W/kg

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

Reference Value = 4.481 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 0.342 W/kg

SAR(1 g) = 0.216 W/kg; SAR(10 g) = 0.131 W/kg

Maximum value of SAR (measured) = 0.281 W/kg

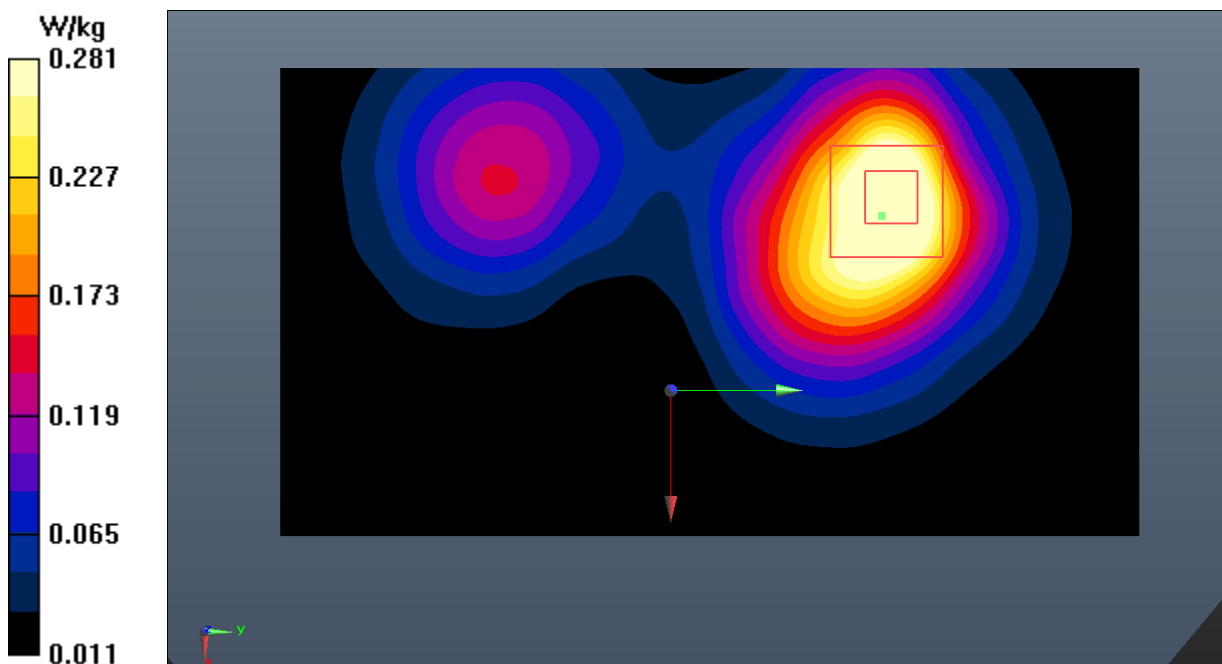


Fig.4 GSM1900 Body

WCDMA Band 2 Head

Date: 2022-12-26

Electronics: DAE4 Sn1527

Medium: Head 1900MHz

Medium parameters used: $f = 1880$ MHz; $\sigma = 1.407$ S/m; $\epsilon_r = 38.767$; $\rho = 1000$ kg/m³

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

Probe: EX3DV4 - SN7621 ConvF (8.90, 8.90, 8.90)

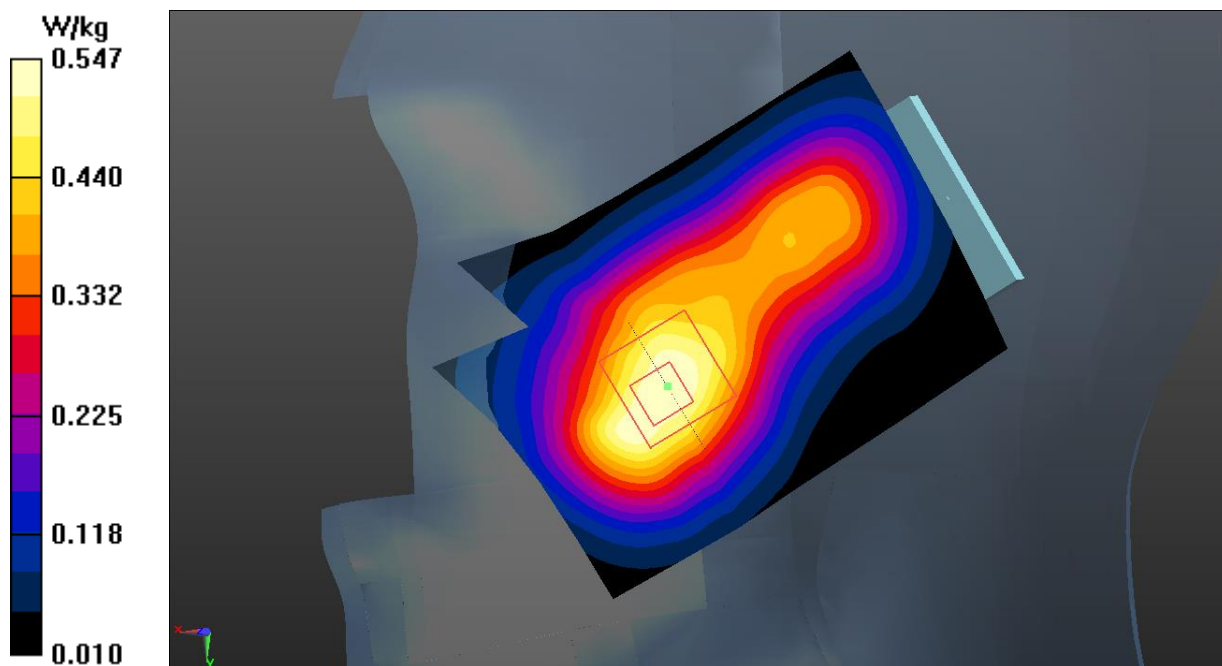
Right Cheek Middle/Area Scan (51x71x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.555 W/kg**Right Cheek Middle/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 7.916 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 0.674 W/kg

SAR(1 g) = 0.429 W/kg; SAR(10 g) = 0.267 W/kg

Maximum value of SAR (measured) = 0.547 W/kg

**Fig.5 WCDMA Band 2 Head**

WCDMA Band 2 Body

Date: 2022-12-26

Electronics: DAE4 Sn1527

Medium: Head 1900MHz

Medium parameters used: $f = 1880$ MHz; $\sigma = 1.407$ S/m; $\epsilon_r = 38.767$; $\rho = 1000$ kg/m³

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

Probe: EX3DV4 - SN7621 ConvF (8.90, 8.90, 8.90)

Rear Side Middle/Area Scan (61x111x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.436 W/kg

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

Reference Value = 4.913 V/m; Power Drift = 0.06 dB

Peak SAR (extrapolated) = 0.544 W/kg

SAR(1 g) = 0.338 W/kg; SAR(10 g) = 0.197 W/kg

Maximum value of SAR (measured) = 0.369 W/kg

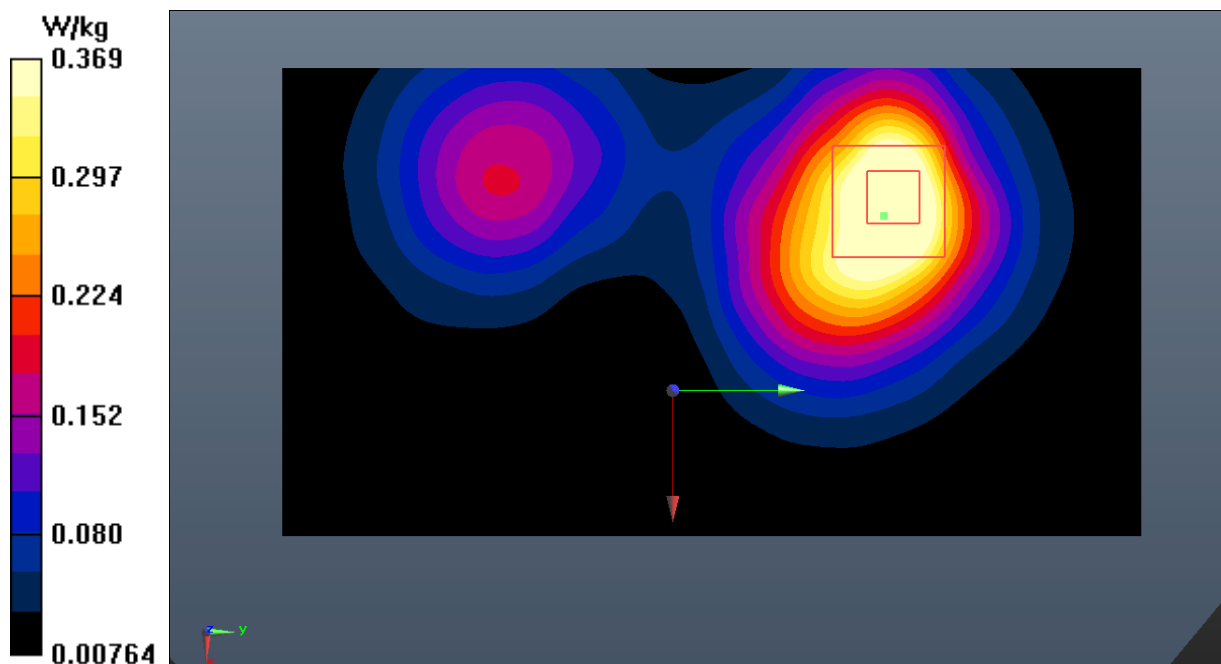


Fig.6 WCDMA Band 2 Body

WCDMA Band 4 Head

Date: 2022-12-19

Electronics: DAE4 Sn1527

Medium: Head 1750MHz

Medium parameters used: $f = 1733$ MHz; $\sigma = 1.378$ S/m; $\epsilon_r = 39.339$; $\rho = 1000$ kg/m³

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

Probe: EX3DV4 - SN7621 ConvF (9.22, 9.22, 9.22)

Right Cheek Middle/Area Scan (51x71x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.581 W/kg

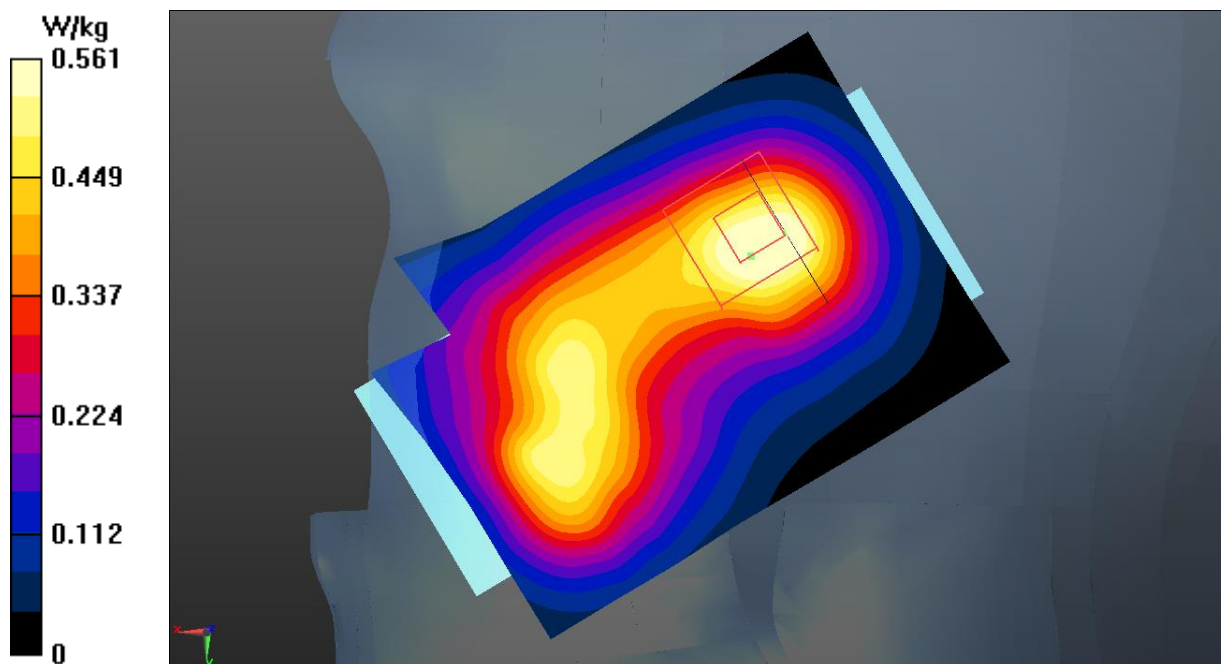
Right Cheek Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 8.161 V/m; Power Drift = -0.09 dB

Peak SAR (extrapolated) = 1.14 W/kg

SAR(1 g) = 0.549 W/kg; SAR(10 g) = 0.237 W/kg

Maximum value of SAR (measured) = 0.561 W/kg

**Fig.7 WCDMA Band 4 Head**

WCDMA Band 4 Body

Date: 2022-12-19

Electronics: DAE4 Sn1527

Medium: Head 1750MHz

Medium parameters used: $f = 1733$ MHz; $\sigma = 1.378$ S/m; $\epsilon_r = 39.339$; $\rho = 1000$ kg/m³

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

Probe: EX3DV4 - SN7621 ConvF (9.22, 9.22, 9.22)

Rear Side Middle/Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.102 W/kg

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

Reference Value = 3.028 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 0.133 W/kg

SAR(1 g) = 0.079 W/kg; SAR(10 g) = 0.041 W/kg

Maximum value of SAR (measured) = 0.0900 W/kg

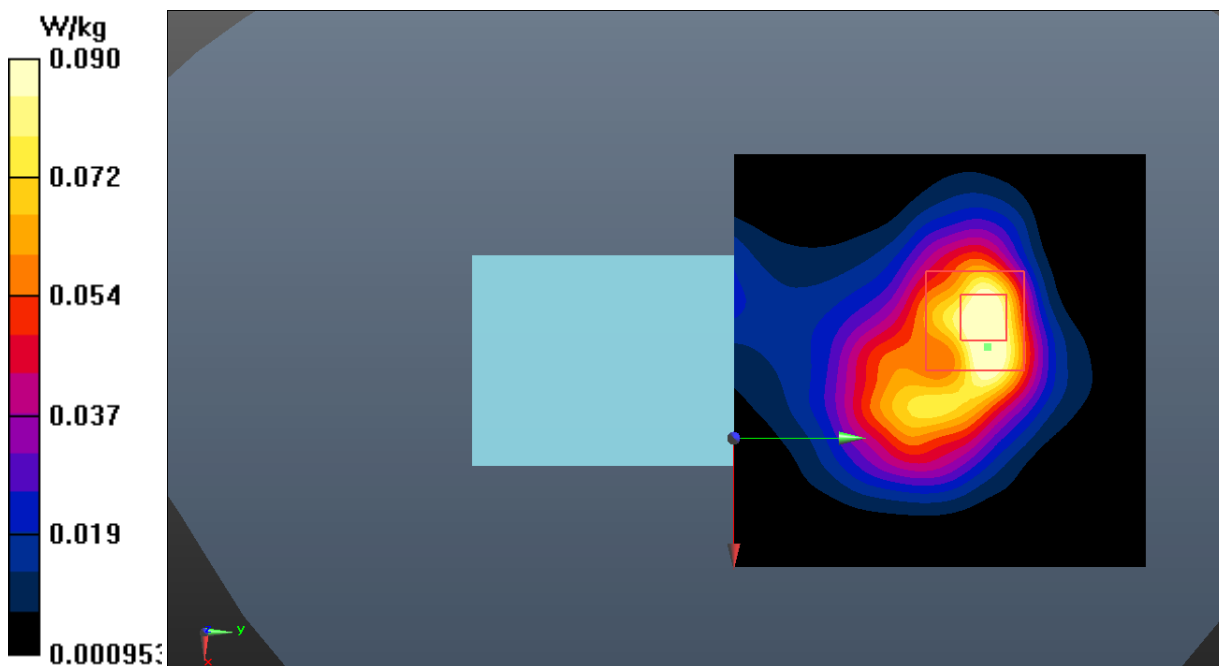


Fig.8 WCDMA Band 4 Body

WCDMA Band 5 Head

Date: 2022-12-25

Electronics: DAE4 Sn1527

Medium: Head 835MHz

Medium parameters used (interpolated): $f = 826.4$ MHz; $\sigma = 0.909$ S/m; $\epsilon_r = 40.588$; $\rho = 1000$ kg/m³

Communication System: UID 0, WCDMA (0) Frequency: 826.4 MHz Duty Cycle: 1:1

Probe: EX3DV4 - SN7621 ConvF (11.12, 11.12, 11.12)

Left Cheek Low/Area Scan (51x71x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.932 W/kg

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

Reference Value = 9.109 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 1.01 W/kg

SAR(1 g) = 0.757 W/kg; SAR(10 g) = 0.532 W/kg

Maximum value of SAR (measured) = 0.891 W/kg

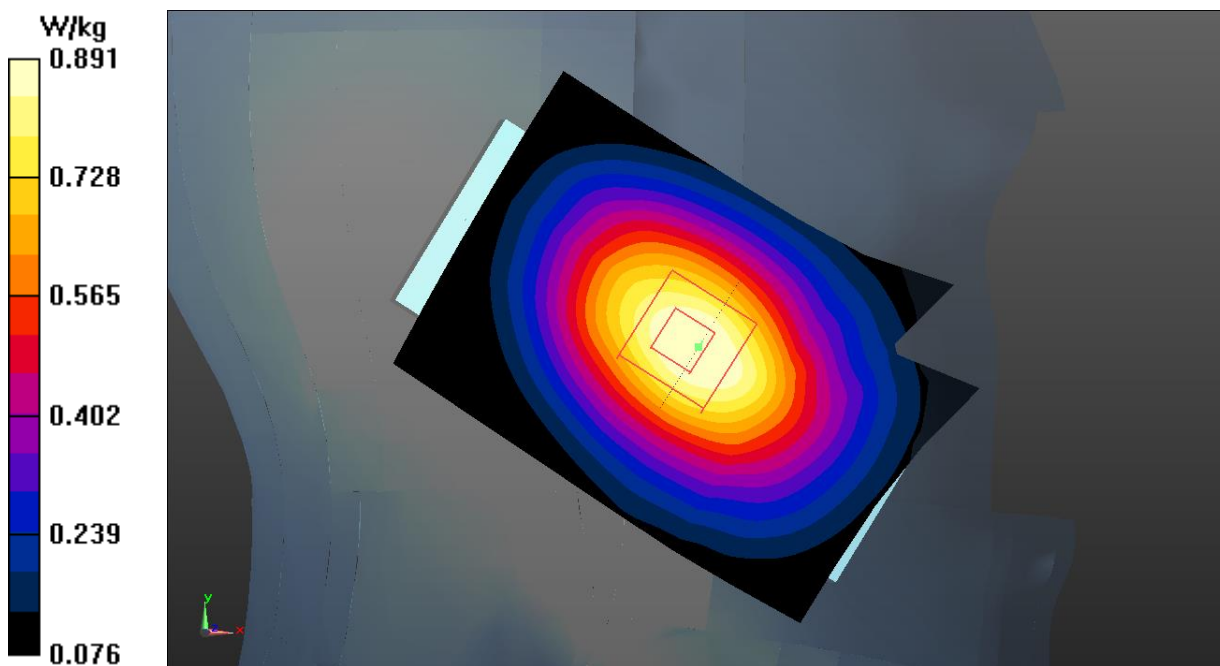


Fig.9 WCDMA Band 5 Head

WCDMA Band 5 Body

Date: 2022-12-25

Electronics: DAE4 Sn1527

Medium: Head 835MHz

Medium parameters used (interpolated): $f = 836.6$ MHz; $\sigma = 0.918$ S/m; $\epsilon_r = 40.466$; $\rho = 1000$ kg/m³

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

Probe: EX3DV4 - SN7621 ConvF (11.12, 11.12, 11.12)

Rear Side Middle/Area Scan (61x81x1): Interpolated grid: $dx=1.500$ mm, $dy=1.500$ mm

Maximum value of SAR (interpolated) = 0.728 W/kg

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

Reference Value = 24.24 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 0.822 W/kg

SAR(1 g) = 0.611 W/kg; SAR(10 g) = 0.431 W/kg

Maximum value of SAR (measured) = 0.650 W/kg

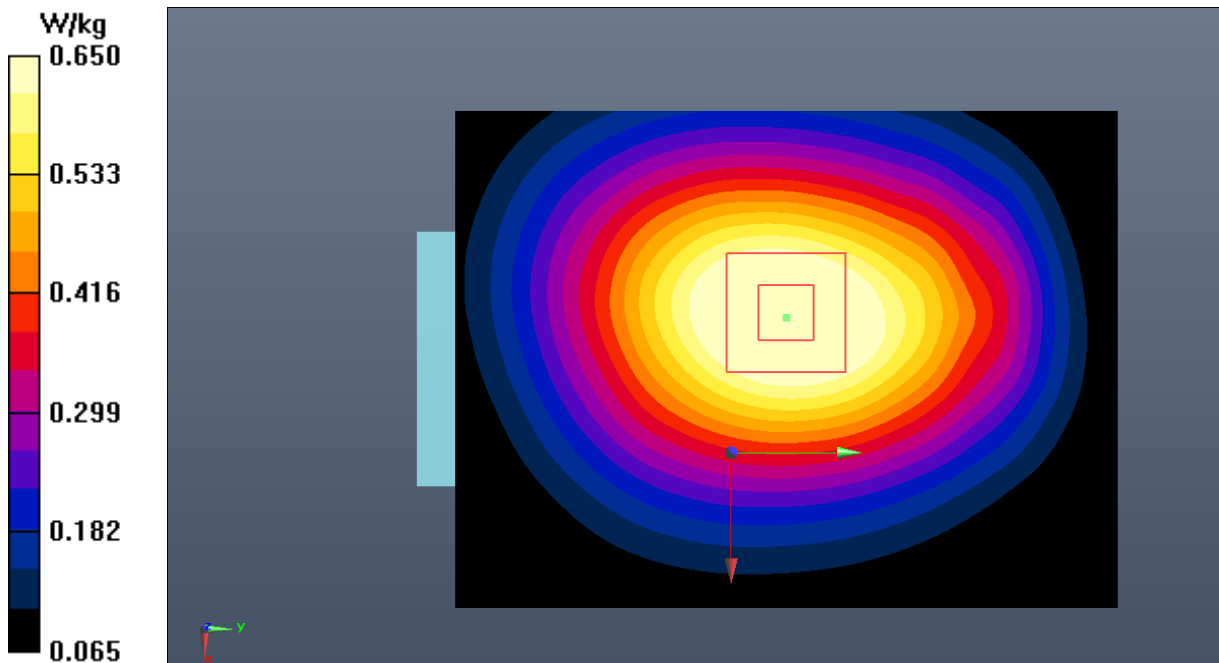


Fig.10 WCDMA Band 5 Body

LTE Band 2 Head

Date: 2022-12-26

Electronics: DAE4 Sn1527

Medium: Head 1900MHz

Medium parameters used: $f = 1860$ MHz; $\sigma = 1.39$ S/m; $\epsilon_r = 38.845$; $\rho = 1000$ kg/m³

Communication System: UID 0, LTE_FDD (0) Frequency: 1860 MHz Duty Cycle: 1:1

Probe: EX3DV4 - SN7621 ConvF (8.90, 8.90, 8.90)

Right Cheek Low 1RB0/Area Scan (51x71x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.203 W/kg**Right Cheek Low 1RB0/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 4.346 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 0.245 W/kg

SAR(1 g) = 0.158 W/kg; SAR(10 g) = 0.099 W/kg

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

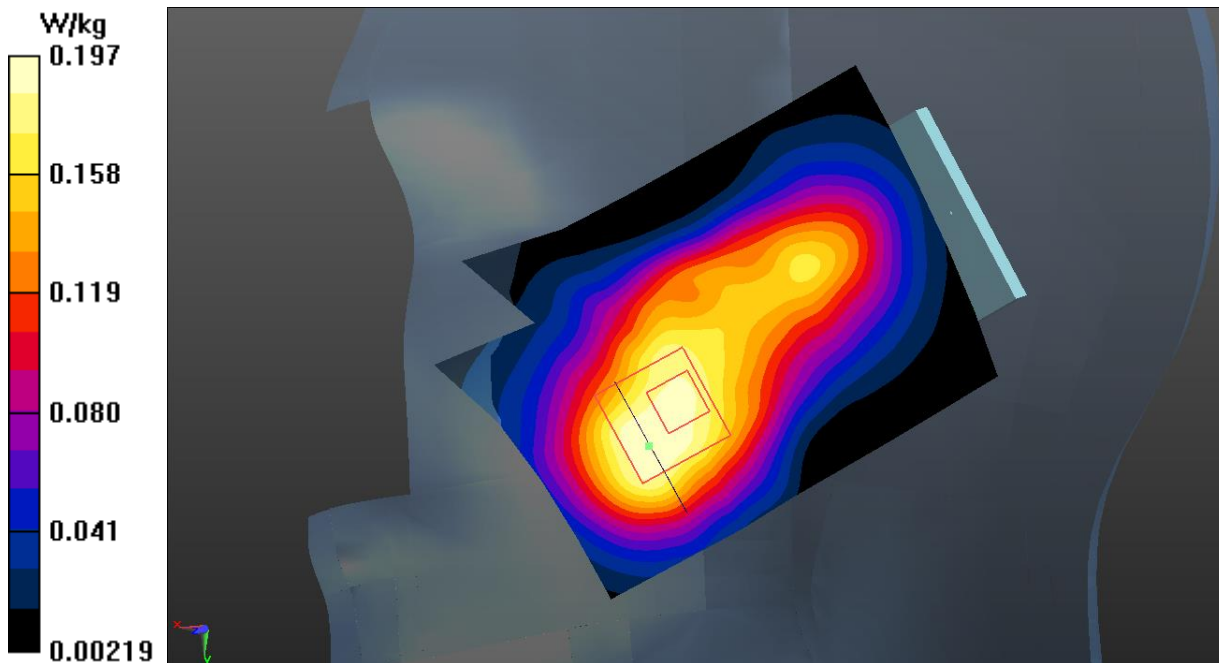


Fig.11 LTE Band 2 Head

LTE Band 2 Body

Date: 2022-12-26

Electronics: DAE4 Sn1527

Medium: Head 1900MHz

Medium parameters used: $f = 1860$ MHz; $\sigma = 1.39$ S/m; $\epsilon_r = 38.845$; $\rho = 1000$ kg/m³

Communication System: UID 0, LTE_FDD (0) Frequency: 1860 MHz Duty Cycle: 1:1

Probe: EX3DV4 - SN7621 ConvF (8.90, 8.90, 8.90)

Rear Side Low 1RB0/Area Scan (61x111x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
 Maximum value of SAR (interpolated) = 0.373 W/kg

Rear Side Low 1RB0/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 4.021 V/m; Power Drift = 0.10 dB

Peak SAR (extrapolated) = 0.446 W/kg

SAR(1 g) = 0.275 W/kg; SAR(10 g) = 0.158 W/kg

Maximum value of SAR (measured) = 0.291 W/kg

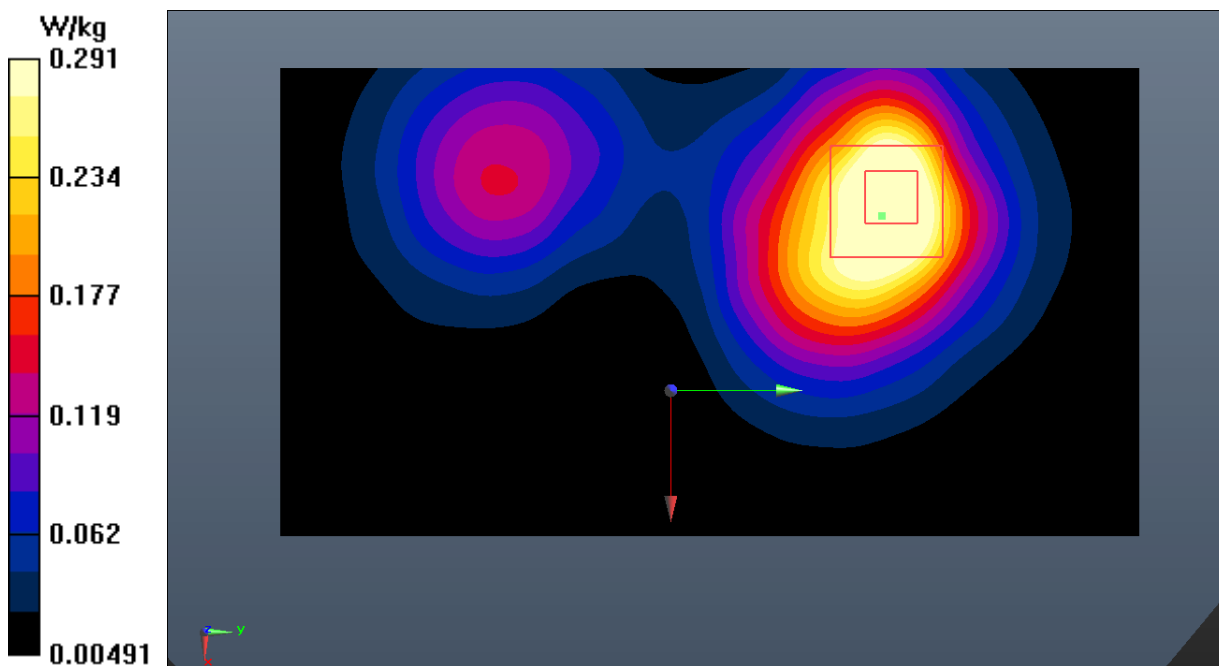


Fig.12 LTE Band 2 Body

LTE Band 4 Head

Date: 2022-12-19

Electronics: DAE4 Sn1527

Medium: Head 1750MHz

Medium parameters used: $f = 1745$ MHz; $\sigma = 1.389$ S/m; $\epsilon_r = 39.293$; $\rho = 1000$ kg/m³

Communication System: UID 0, LTE_FDD (0) Frequency: 1745 MHz Duty Cycle: 1:1

Probe: EX3DV4 - SN7621 ConvF (9.22, 9.22, 9.22)

Right Cheek High 1RB99/Area Scan (51x71x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.15 W/kg**Right Cheek High 1RB99/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 10.48 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 1.36 W/kg

SAR(1 g) = 0.900 W/kg; SAR(10 g) = 0.558 W/kg

Maximum value of SAR (measured) = 1.13 W/kg

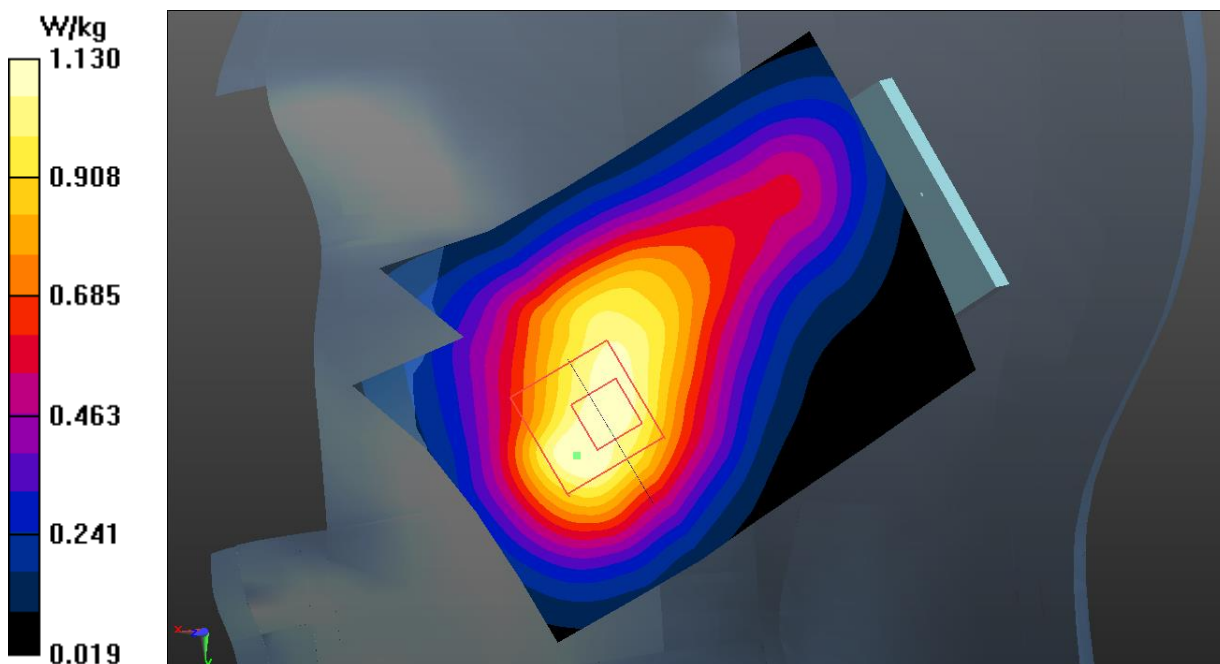


Fig.13 LTE Band 4 Head

LTE Band 4 Body

Date: 2022-12-19

Electronics: DAE4 Sn1527

Medium: Head 1750MHz

Medium parameters used: $f = 1745$ MHz; $\sigma = 1.389$ S/m; $\epsilon_r = 39.293$; $\rho = 1000$ kg/m³

Communication System: UID 0, LTE_FDD (0) Frequency: 1745 MHz Duty Cycle: 1:1

Probe: EX3DV4 - SN7621 ConvF (9.22, 9.22, 9.22)

Rear Side High 1RB99/Area Scan (61x71x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.24 W/kg**Rear Side High 1RB99/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 11.41 V/m; Power Drift = -0.18 dB

Peak SAR (extrapolated) = 1.45 W/kg

SAR(1 g) = 0.883 W/kg; SAR(10 g) = 0.517 W/kg

Maximum value of SAR (measured) = 0.968 W/kg

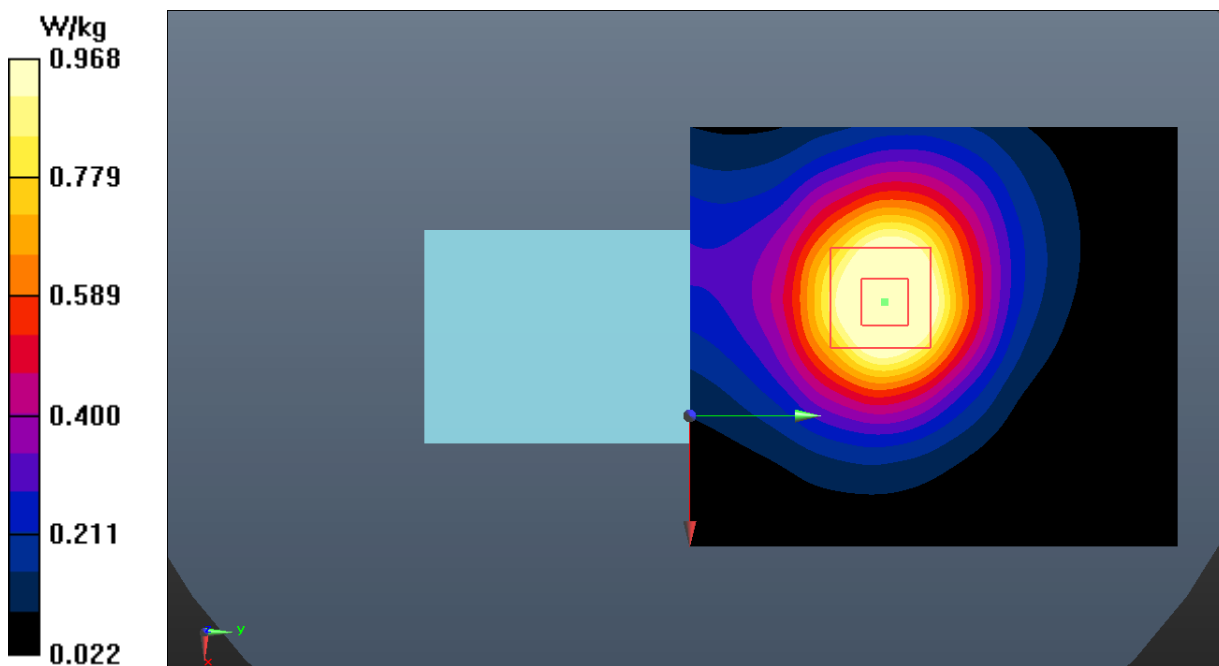


Fig.14 LTE Band 4 Body

LTE Band 5 Head

Date: 2022-12-25

Electronics: DAE4 Sn1527

Medium: Head 835MHz

Medium parameters used (interpolated): $f = 836.5$ MHz; $\sigma = 0.918$ S/m; $\epsilon_r = 40.467$; $\rho = 1000$ kg/m³

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

Probe: EX3DV4 - SN7621 ConvF (11.12, 11.12, 11.12)

Left Cheek Middle 1RB49/Area Scan (51x71x1): Interpolated grid: $dx=1.500$ mm, $dy=1.500$ mm
Maximum value of SAR (interpolated) = 1.20 W/kg**Left Cheek Middle 1RB49/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: $dx=8$ mm, $dy=8$ mm, $dz=5$ mm

Reference Value = 10.41 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 1.29 W/kg

SAR(1 g) = 0.967 W/kg; SAR(10 g) = 0.677 W/kg

Maximum value of SAR (measured) = 1.13 W/kg

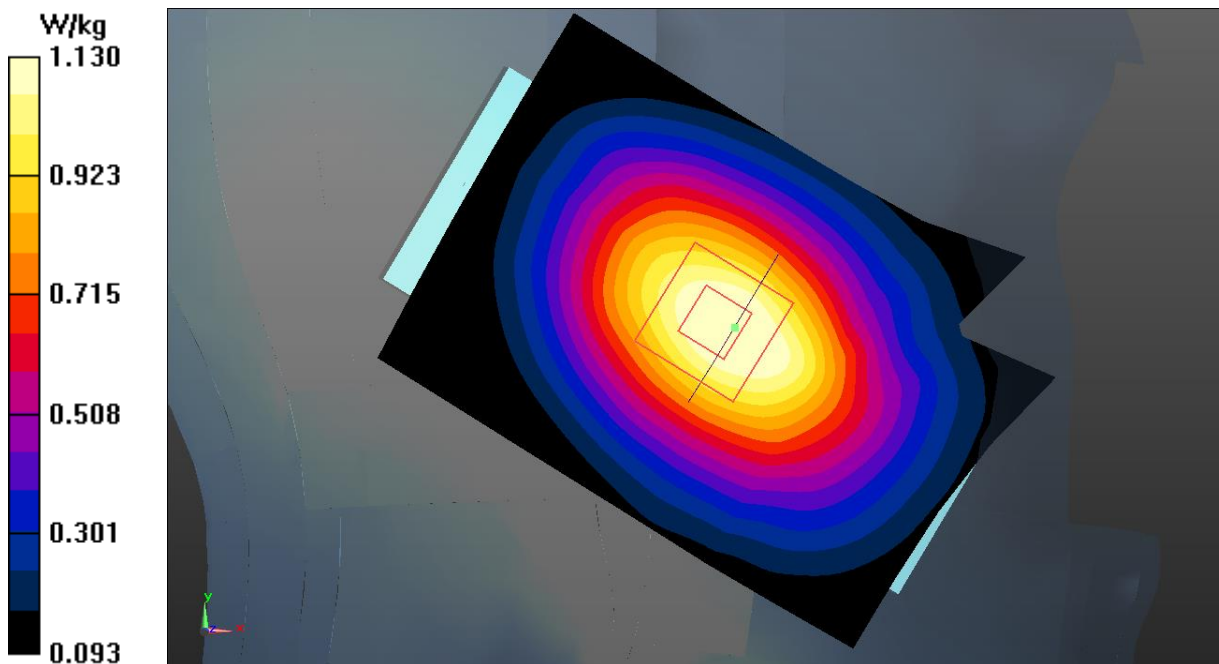


Fig.15 LTE Band 5 Head

LTE Band 5 Body

Date: 2022-12-25

Electronics: DAE4 Sn1527

Medium: Head 835MHz

Medium parameters used (interpolated): $f = 836.5$ MHz; $\sigma = 0.918$ S/m; $\epsilon_r = 40.467$; $\rho = 1000$ kg/m³

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

Probe: EX3DV4 - SN7621 ConvF (11.12, 11.12, 11.12)

Rear Side Middle 1RB49/Area Scan (61x91x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.960 W/kg

Rear Side Middle 1RB49/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 24.66 V/m; Power Drift = 0.08 dB

Peak SAR (extrapolated) = 1.09 W/kg

SAR(1 g) = 0.800 W/kg; SAR(10 g) = 0.563 W/kg

Maximum value of SAR (measured) = 0.851 W/kg

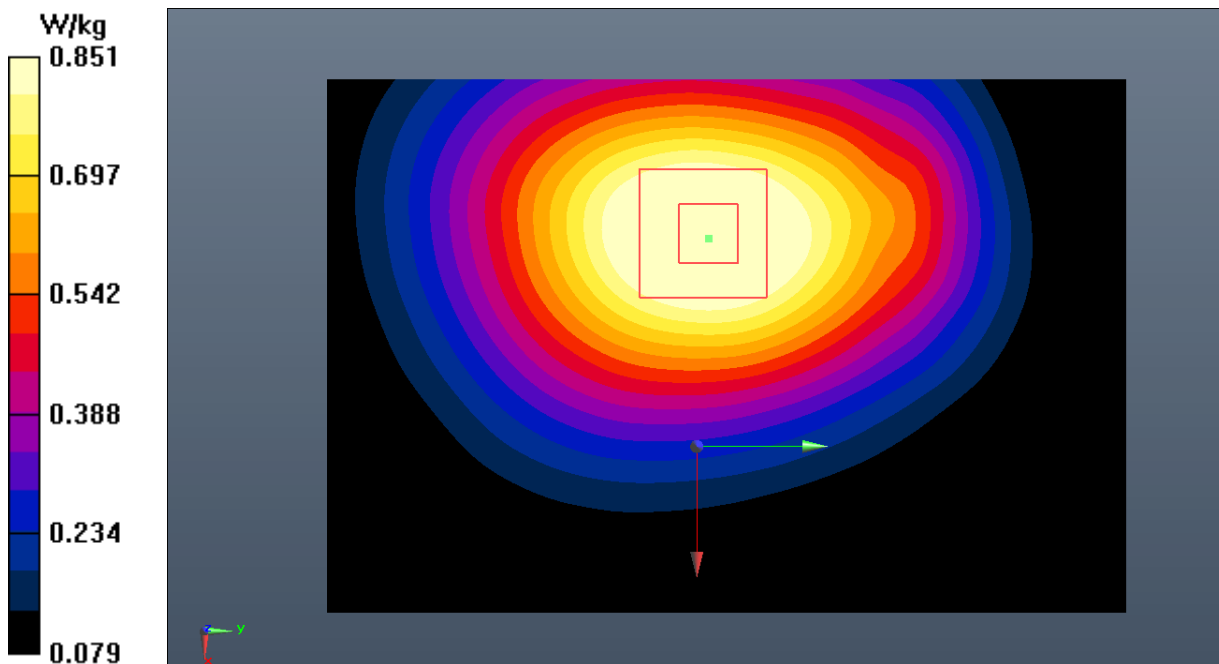


Fig.16 LTE Band 5 Body

LTE Band 7 Head

Date: 2022-12-27

Electronics: DAE4 Sn1527

Medium: Head 2550MHz

Medium parameters used: $f = 2560$ MHz; $\sigma = 1.951$ S/m; $\epsilon_r = 37.993$; $\rho = 1000$ kg/m³

Communication System: UID 0, LTE_FDD (0) Frequency: 2560 MHz Duty Cycle: 1:1

Probe: EX3DV4 - SN7621 ConvF (7.93, 7.93, 7.93)

Left Cheek High 1RB99/Area Scan (71x111x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.608 W/kg**Left Cheek High 1RB99/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 4.199 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 0.767 W/kg

SAR(1 g) = 0.438 W/kg; SAR(10 g) = 0.255 W/kg

Maximum value of SAR (measured) = 0.589 W/kg

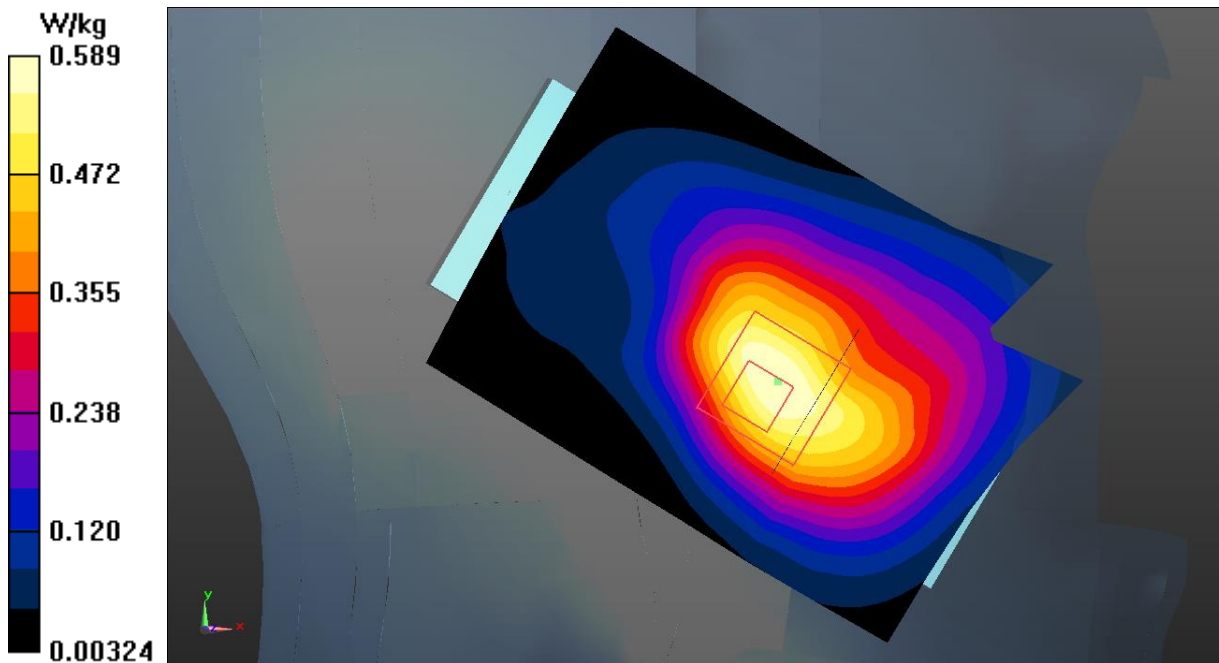


Fig.17 LTE Band 7 Head

LTE Band 7 Body

Date: 2022-12-27

Electronics: DAE4 Sn1527

Medium: Head 2550MHz

Medium parameters used: $f = 2560$ MHz; $\sigma = 1.951$ S/m; $\epsilon_r = 37.993$; $\rho = 1000$ kg/m³

Communication System: UID 0, LTE_FDD (0) Frequency: 2560 MHz Duty Cycle: 1:1

Probe: EX3DV4 - SN7621 ConvF (7.93, 7.93, 7.93)

Front Side High 1RB99/Area Scan (71x151x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.325 W/kg

Front Side High 1RB99/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 7.317 V/m; Power Drift = 0.15 dB

Peak SAR (extrapolated) = 0.434 W/kg

SAR(1 g) = 0.236 W/kg; SAR(10 g) = 0.129 W/kg

Maximum value of SAR (measured) = 0.256 W/kg

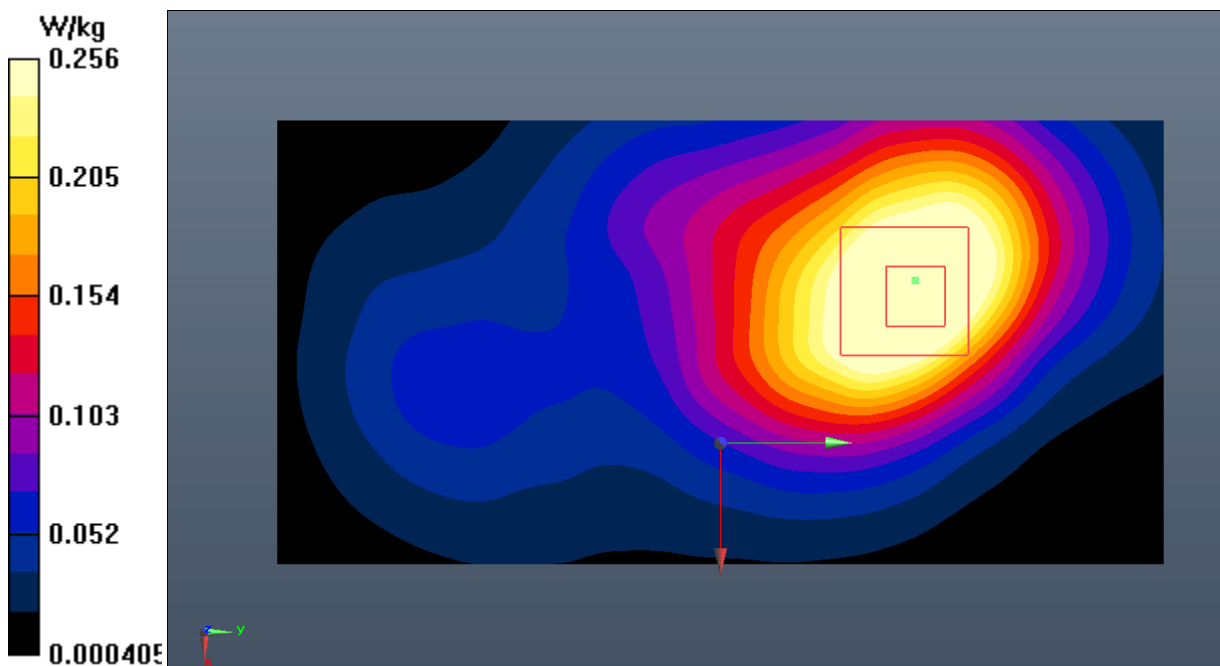


Fig.18 LTE Band 7 Body

LTE Band 13 Head

Date: 2022-12-20

Electronics: DAE4 Sn1527

Medium: Head 750MHz

Medium parameters used: $f = 782 \text{ MHz}$; $\sigma = 0.886 \text{ S/m}$; $\epsilon_r = 42.138$; $\rho = 1000 \text{ kg/m}^3$

Communication System: UID 0, LTE_FDD (0) Frequency: 782 MHz Duty Cycle: 1:1

Probe: EX3DV4 - SN7621 ConvF (11.12, 11.12, 11.12)

Left Cheek Middle 1RB0/Area Scan (51x71x1): Interpolated grid: $dx=1.500 \text{ mm}$, $dy=1.500 \text{ mm}$
Maximum value of SAR (interpolated) = 0.445 W/kg**Left Cheek Middle 1RB0/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$,
 $dz=5\text{mm}$

Reference Value = 6.597 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 0.487 W/kg

SAR(1 g) = 0.367 W/kg; SAR(10 g) = 0.261 W/kg

Maximum value of SAR (measured) = 0.433 W/kg

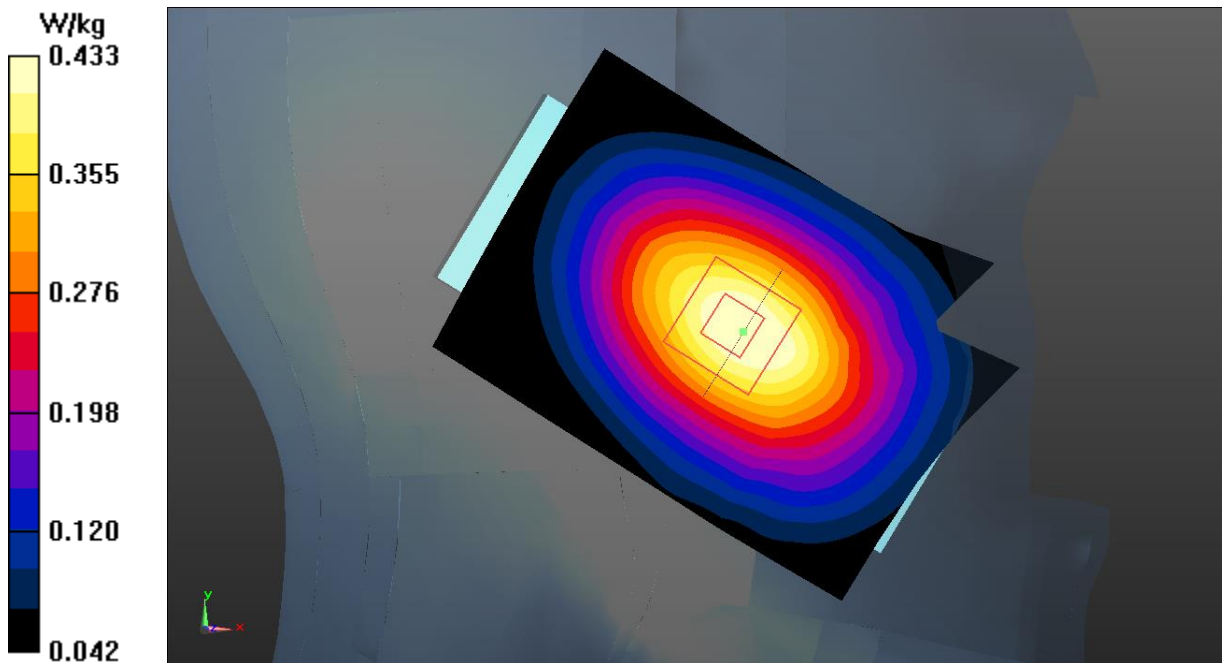


Fig.19 LTE Band 13 Head

LTE Band 13 Bod

Date: 2022-12-20

Electronics: DAE4 Sn1527

Medium: Head 750MHz

Medium parameters used: $f = 782 \text{ MHz}$; $\sigma = 0.886 \text{ S/m}$; $\epsilon_r = 42.138$; $\rho = 1000 \text{ kg/m}^3$

Communication System: UID 0, LTE_FDD (0) Frequency: 782 MHz Duty Cycle: 1:1

Probe: EX3DV4 - SN7621 ConvF (11.12, 11.12, 11.12)

Rear Side Middle 1RB0/Area Scan (61x91x1): Interpolated grid: $dx=1.500 \text{ mm}$, $dy=1.500 \text{ mm}$
Maximum value of SAR (interpolated) = 0.431 W/kg

Rear Side Middle 1RB0/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

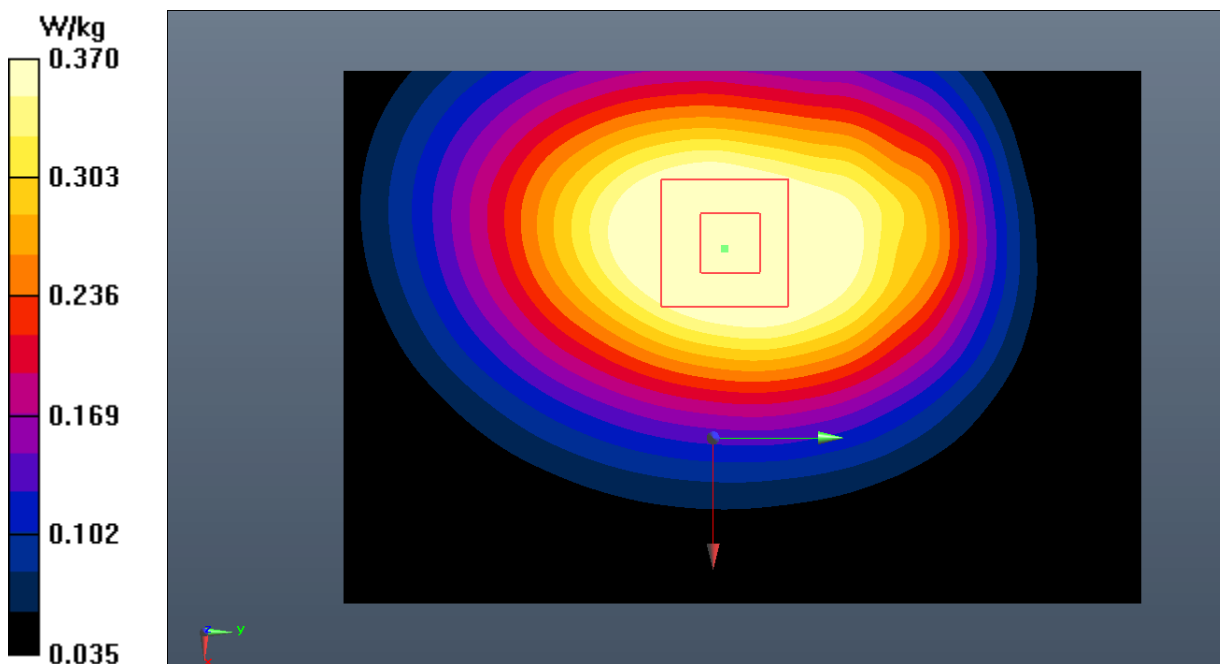
Reference Value = 17.29 V/m ; Power Drift = 0.06 dB Peak SAR (extrapolated) = 0.469 W/kg **SAR(1 g) = 0.349 W/kg ; SAR(10 g) = 0.248 W/kg** Maximum value of SAR (measured) = 0.370 W/kg 

Fig.20 LTE Band 13 Body

Bluetooth Head

Date: 2022-12-17

Electronics: DAE4 Sn1527

Medium: Head 2450MHz

Medium parameters used: $f = 2402$ MHz; $\sigma = 1.776$ S/m; $\epsilon_r = 38.609$; $\rho = 1000$ kg/m³

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

Probe: EX3DV4 - SN7621 ConvF (8.17, 8.17, 8.17)

Right Cheek Ch.0/Area Scan (71x91x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.0804 W/kg

Right Cheek Ch.0/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 3.201 V/m; Power Drift = 0.16 dB
Peak SAR (extrapolated) = 0.0870 W/kg
SAR(1 g) = 0.037 W/kg; SAR(10 g) = 0.017 W/kg
Maximum value of SAR (measured) = 0.0550 W/kg

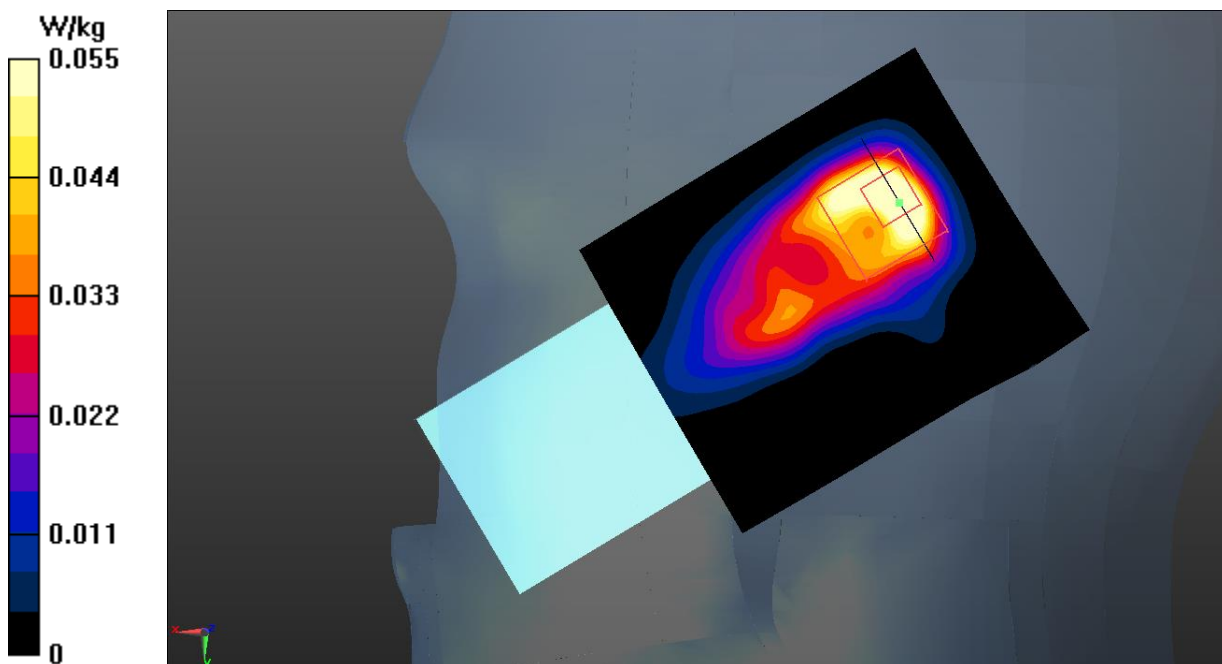


Fig.21 Bluetooth Head

Bluetooth Body

Date: 2022-12-17

Electronics: DAE4 Sn1527

Medium: Head 2450MHz

Medium parameters used: $f = 2402$ MHz; $\sigma = 1.776$ S/m; $\epsilon_r = 38.609$; $\rho = 1000$ kg/m³

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

Probe: EX3DV4 - SN7621 ConvF (8.17, 8.17, 8.17)

Rear Side Ch.0/Area Scan (91x91x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.00301 W/kg

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

Reference Value = 0.3030 V/m; Power Drift = 0.10 dB

Peak SAR (extrapolated) = 0.0120 W/kg

SAR(1 g) = 0.00238 W/kg; SAR(10 g) = 0.000605 W/kg

Maximum value of SAR (measured) = 0.00223 W/kg

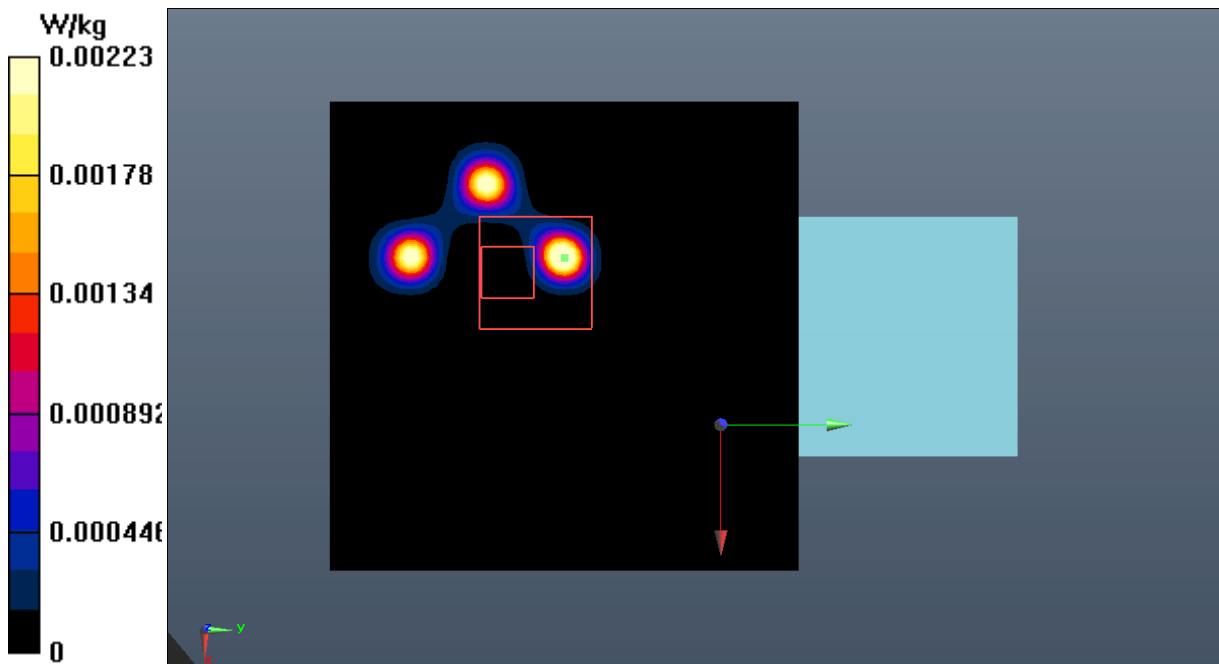


Fig.22 Bluetooth Body

ANNEX B: System Verification Results

750MHz

Date: 2022-12-20

Electronics: DAE4 Sn1527

Medium: Head 750MHz

Medium parameters used: $f = 750 \text{ MHz}$; $\sigma = 0.866 \text{ S/m}$; $\epsilon_r = 42.522$; $\rho = 1000 \text{ kg/m}^3$

Communication System: CW_TMC Frequency: 750 MHz Duty Cycle: 1:1

Probe: EX3DV4 - SN7621 ConvF (11.12, 11.12, 11.12)

System Validation/Area Scan (81x161x1): Interpolated grid: $dx=1.000 \text{ mm}$, $dy=1.000 \text{ mm}$

Reference Value = 58.251 V/m; Power Drift = -0.06 dB

SAR(1 g) = 2.10 W/kg; SAR(10 g) = 1.38 W/kg

Maximum value of SAR (interpolated) = 2.75 W/kg

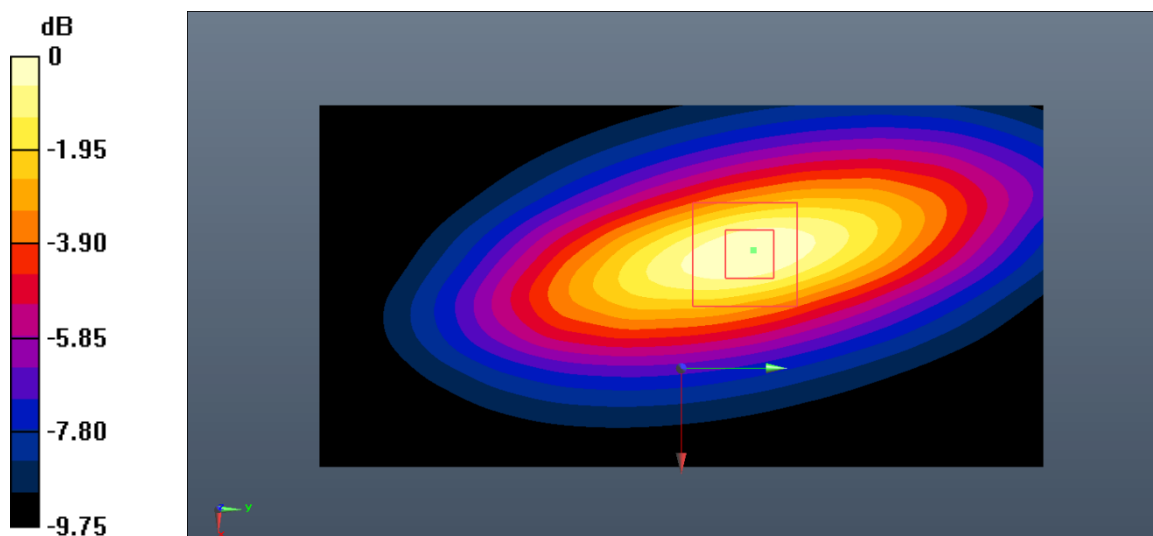
System Validation/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 58.251 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 2.99 W/kg

SAR(1 g) = 2.03 W/kg; SAR(10 g) = 1.36 W/kg

Maximum value of SAR (measured) = 2.72 W/kg



0 dB = 2.72 W/kg = 4.35 dB W/kg

Fig.B.1. Validation 750MHz 250mW

835MHz

Date: 2022-12-25

Electronics: DAE4 Sn1527

Medium: Head 835MHz

Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 0.917 \text{ S/m}$; $\epsilon_r = 40.485$; $\rho = 1000 \text{ kg/m}^3$

Communication System: CW_TMC Frequency: 835 MHz Duty Cycle: 1:1

Probe: EX3DV4 - SN7621 ConvF (11.12, 11.12, 11.12)

System Validation/Area Scan (91x161x1): Interpolated grid: $dx=1.000 \text{ mm}$, $dy=1.000 \text{ mm}$

Reference Value = 63.849 V/m; Power Drift = 0.09 dB

SAR(1 g) = 2.46 W/kg; SAR(10 g) = 1.59 W/kg

Maximum value of SAR (interpolated) = 3.65 W/kg

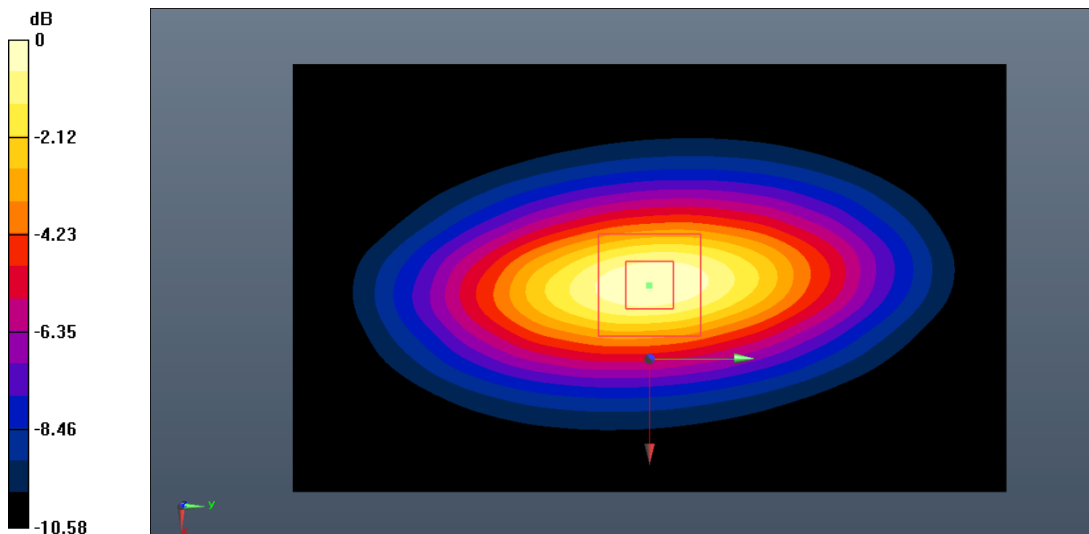
System Validation/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 63.849 V/m; Power Drift = 0.09 dB

Peak SAR (extrapolated) = 4.33 W/kg

SAR(1 g) = 2.50 W/kg; SAR(10 g) = 1.61 W/kg

Maximum value of SAR (measured) = 3.69 W/kg



0 dB = 3.69 W/kg = 5.67 dB W/kg

Fig.B.2. Validation 835MHz 250mW

1750MHz

Date: 2022-12-19

Electronics: DAE4 Sn1527

Medium: Head 1750MHz

Medium parameters used: $f = 1750$ MHz; $\sigma = 1.393$ S/m; $\epsilon_r = 39.273$; $\rho = 1000$ kg/m³

Communication System: CW_TMC Frequency: 1750 MHz Duty Cycle: 1:1

Probe: EX3DV4 - SN7621 ConvF (9.22, 9.22, 9.22)

System Validation/Area Scan (81x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Reference Value = 81.454 V/m; Power Drift = 0.05 dB

SAR(1 g) = 9.22 W/kg; SAR(10 g) = 4.94 W/kg

Maximum value of SAR (interpolated) = 11.2 W/kg

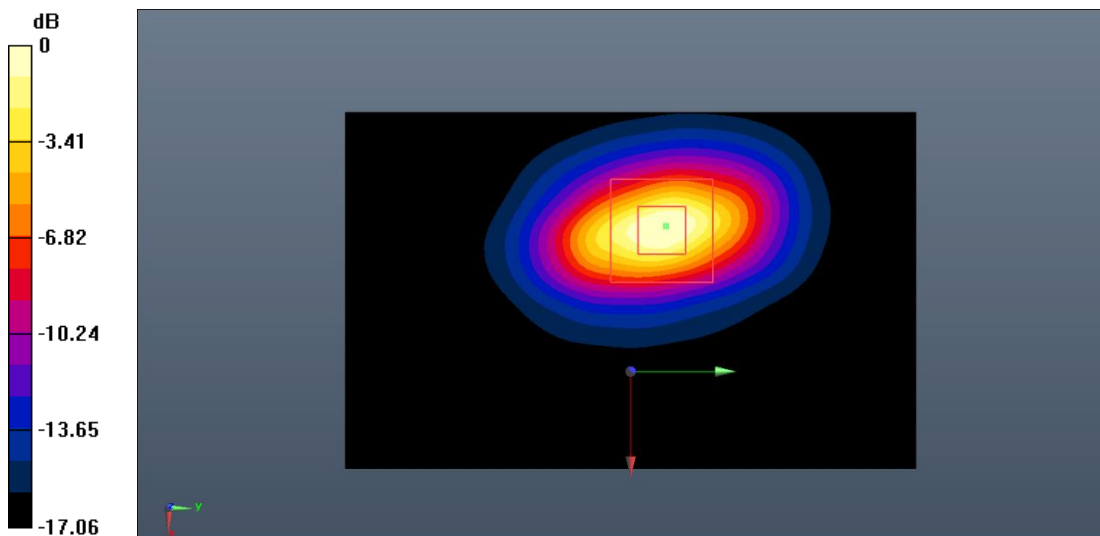
System Validation/Zoom Scan (7x7x7)/Cube0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 81.454 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 24.5 W/kg

SAR(1 g) = 9.47 W/kg; SAR(10 g) = 5.05 W/kg

Maximum value of SAR (measured) = 11.5 W/kg



0 dB = 11.5 W/kg = 10.61 dB W/kg

Fig.B.3. Validation 1750MHz 250mW

1900MHz

Date: 2022-12-26

Electronics: DAE4 Sn1527

Medium: Head 1900MHz

Medium parameters used: $f = 1900 \text{ MHz}$; $\sigma = 1.425 \text{ S/m}$; $\epsilon_r = 38.689$; $\rho = 1000 \text{ kg/m}^3$

Communication System: CW_TMC Frequency: 1900 MHz Duty Cycle: 1:1

Probe: EX3DV4 - SN7621 ConvF (8.90, 8.90, 8.90)

System Validation/Area Scan (91x91x1): Interpolated grid: $dx=1.000 \text{ mm}$, $dy=1.000 \text{ mm}$

Reference Value = 84.582 V/m; Power Drift = 0.13 dB

SAR(1 g) = 10.2 W/kg; SAR(10 g) = 5.18 W/kg

Maximum value of SAR (interpolated) = 12.4 W/kg

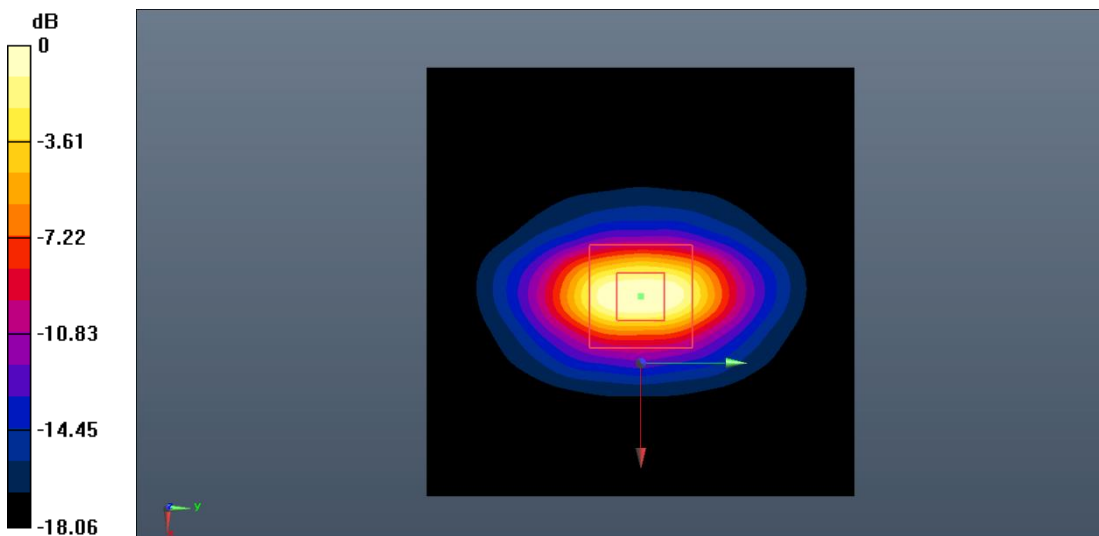
System Validation/Zoom Scan (7x7x7)/Cube0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 84.582 V/m; Power Drift = 0.13 dB

Peak SAR (extrapolated) = 27.7 W/kg

SAR(1 g) = 10.5 W/kg; SAR(10 g) = 5.29 W/kg

Maximum value of SAR (measured) = 12.7 W/kg



0 dB = 12.7 W/kg = 11.04 dB W/kg

Fig.B.4. Validation 1900MHz 250mW

2450MHz

Date: 2022-12-17

Electronics: DAE4 Sn1527

Medium: Head 2450MHz

Medium parameters used: $f = 2450 \text{ MHz}$; $\sigma = 1.833 \text{ S/m}$; $\epsilon_r = 38.451$; $\rho = 1000 \text{ kg/m}^3$

Communication System: CW_TMC Frequency: 2450 MHz Duty Cycle: 1:1

Probe: EX3DV4 - SN7621 ConvF (8.17, 8.17, 8.17)

System Validation/Area Scan (81x121x1): Interpolated grid: $dx=1.000 \text{ mm}$, $dy=1.000 \text{ mm}$

Reference Value = 92.458 V/m; Power Drift = 0.02 dB

SAR(1 g) = 13.6 W/kg; SAR(10 g) = 6.12 W/kg

Maximum value of SAR (interpolated) = 15.7 W/kg

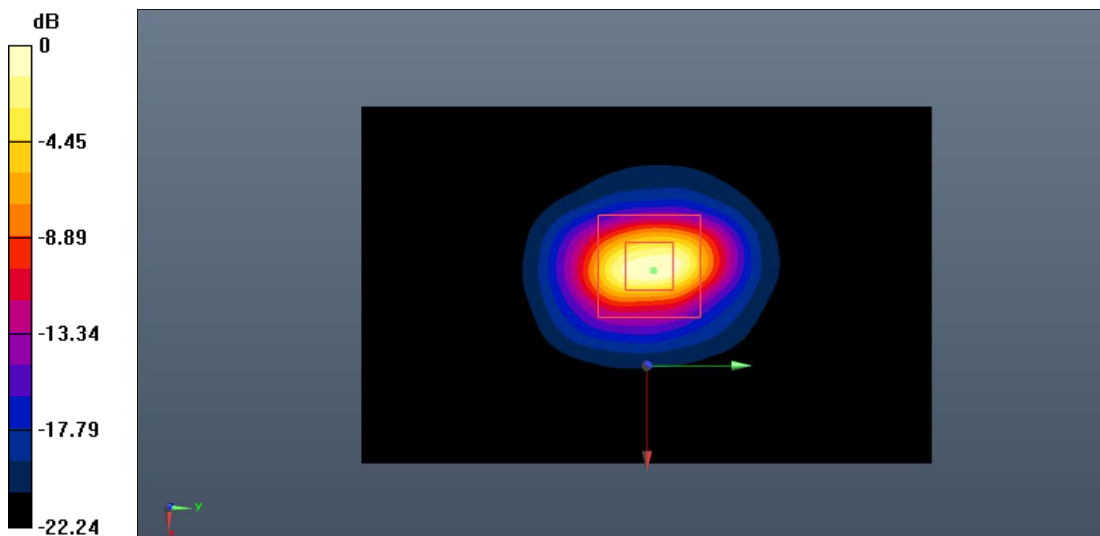
System Validation/Zoom Scan (7x7x7)/Cube0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 92.458 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 37.3 W/kg

SAR(1 g) = 13.8 W/kg; SAR(10 g) = 6.16 W/kg

Maximum value of SAR (measured) = 16.0 W/kg



0 dB = 16.0 W/kg = 12.04 dB W/kg

Fig.B.5. Validation 2450MHz 250mW

2550MHz

Date: 2022-12-27

Electronics: DAE4 Sn1527

Medium: Head 2550MHz

Medium parameters used: $f = 2550 \text{ MHz}$; $\sigma = 1.939 \text{ S/m}$; $\epsilon_r = 38.026$; $\rho = 1000 \text{ kg/m}^3$

Communication System: CW_TMC Frequency: 2550 MHz Duty Cycle: 1:1

Probe: EX3DV4 - SN7621 ConvF (8.17, 8.17, 8.17)

System Validation/Area Scan (91x91x1): Interpolated grid: $dx=1.000 \text{ mm}$, $dy=1.000 \text{ mm}$

Reference Value = 92.769 V/m; Power Drift = 0.07 dB

SAR(1 g) = 14.1 W/kg; SAR(10 g) = 6.15 W/kg

Maximum value of SAR (interpolated) = 16.0 W/kg

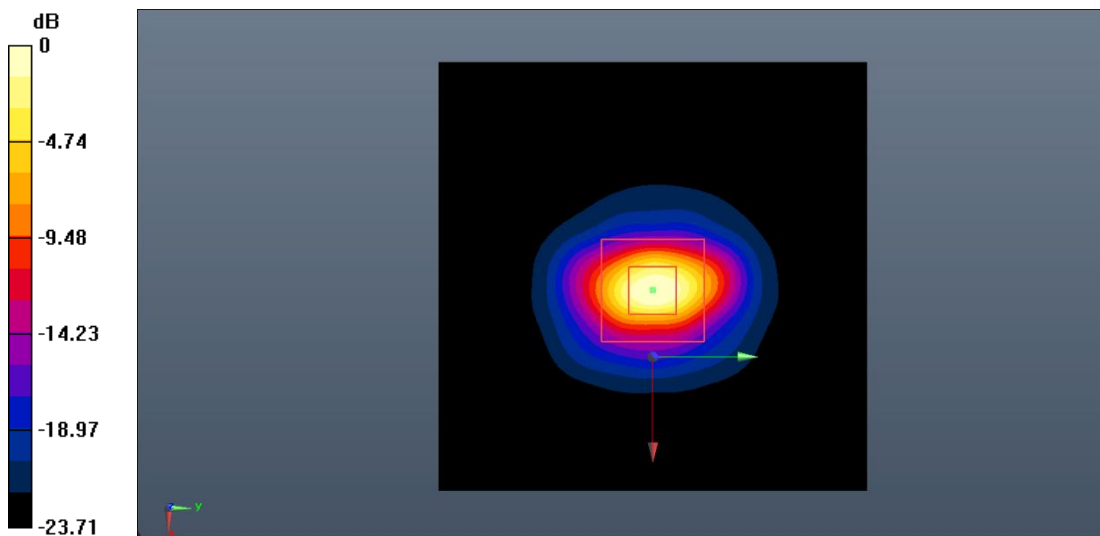
System Validation/Zoom Scan (7x7x7)/Cube0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 92.769 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 38.3 W/kg

SAR(1 g) = 14.3 W/kg; SAR(10 g) = 6.39 W/kg

Maximum value of SAR (measured) = 16.2 W/kg



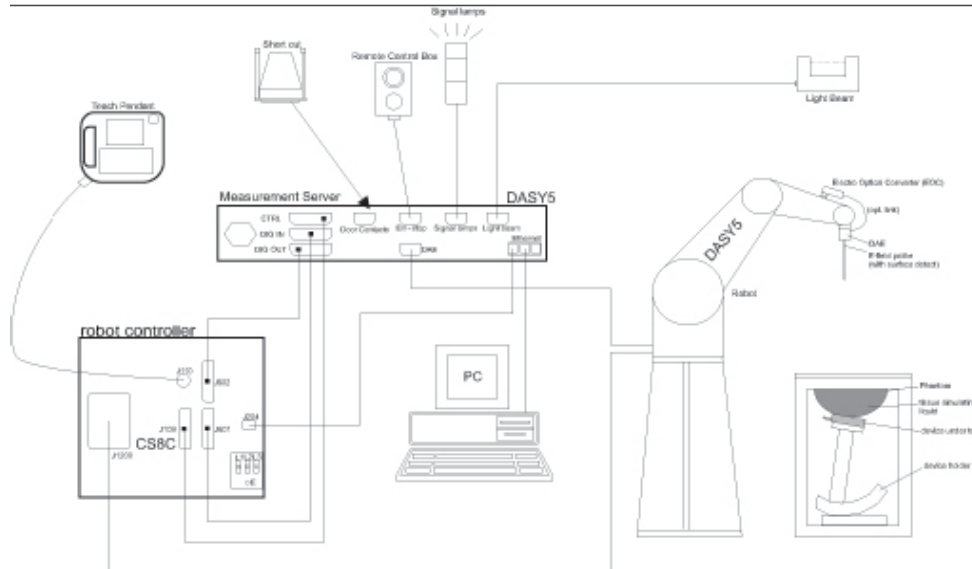
0 dB = 16.2 W/kg = 12.10 dB W/kg

Fig.B.6. Validation 2550MHz 250mW

ANNEX C: SAR Measurement Setup

C.1. Measurement Set-up

DASY5 system for performing compliance tests is illustrated above graphically. This system consists of the following items:



Picture C.1 SAR Lab Test Measurement Set-up

- A standard high precision 6-axis robot (Stäubli TX=RX family) with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic field probe optimized and calibrated for the targeted measurement.
- A data acquisition electronics (DAE) which performs the signal 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 and the DASY5 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.

C.2. DASY5 E-field Probe System

The SAR measurements were conducted with the dosimetric probe designed in the classical triangular configuration and optimized for dosimetric evaluation. The probe is constructed using the thick film technique; with printed resistive lines on ceramic substrates. The probe is equipped with an optical multifiber line ending at the front of the probe tip. It is connected to the EOC box on the robot arm and provides an automatic detection of the phantom surface. Half of the fibers are connected to a pulsed infrared transmitter, the other half to a synchronized receiver. As the probe approaches the surface, the reflection from the surface produces a coupling from the transmitting to the receiving fibers. This reflection increases first during the approach, reaches maximum and then decreases. If the probe is flatly touching the surface, the coupling is zero. The distance of the coupling maximum to the surface is independent of the surface reflectivity and largely independent of the surface to probe angle. The DASY5 software reads the reflection during a software approach and looks for the maximum using 2nd order curve fitting. The approach is stopped at reaching the maximum.

Probe Specifications:

Model:	ES3DV3, EX3DV4
Frequency	10MHz — 6.0GHz(EX3DV4)
Range:	10MHz — 4GHz(ES3DV3)
Calibration:	In head and body simulating tissue at Frequencies from 835 up to 5800MHz
Linearity:	± 0.2 dB(30 MHz to 6 GHz) for EX3DV4 ± 0.2 dB(30 MHz to 4 GHz) for ES3DV3
Dynamic Range:	10 mW/kg — 100W/kg
Probe Length:	330 mm
Probe Tip	
Length:	20 mm
Body Diameter:	12 mm
Tip Diameter:	2.5 mm (3.9 mm for ES3DV3)
Tip-Center:	1 mm (2.0mm for ES3DV3)
Application:	SAR Dosimetry Testing Compliance tests of mobile phones Dosimetry in strong gradient fields



Picture C.2 Near-field Probe



Picture C.3 E-field Probe

C.3. E-field Probe Calibration

Each E-Probe/Probe Amplifier combination has unique calibration parameters. A TEM cell calibration procedure is conducted to determine the proper amplifier settings to enter in the probe parameters. The amplifier settings are determined for a given frequency by subjecting the probe to a known E-field density (1 mW/cm²) using an RF Signal generator, TEM cell, and RF Power Meter.

The free space E-field from amplified probe outputs is determined in a test chamber. This calibration can be performed in a TEM cell if the frequency is below 1 GHz and in a waveguide or other methodologies 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 until the three channels show the maximum reading. The power density readings equate to 1 mW/cm².

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

$$SAR = C \frac{\Delta T}{\Delta t}$$

Where:

Δt = Exposure time (30 seconds),

C = Heat capacity of tissue (brain or muscle),

ΔT = Temperature increase due to RF exposure.

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

Where:

σ = Simulated tissue conductivity,

ρ = Tissue density (kg/m³).

C.4. Other Test Equipment

C.4.1. Data Acquisition Electronics (DAE)

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

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

The input impedance of the DAE is 200 MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.



PictureC.4: DAE

C.4.2. Robot

The SPEAG DASY system uses the high precision robots (DASY5: RX160L) type from Stäubli SA (France). For the 6-axis controller system, the robot controller version from Stäubli is used. The Stäubli robot series have many features that are important for our application:

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



Picture C.5 DASY 5

C.4.3. Measurement Server

The Measurement server is based on a PC/104 CPU board with CPU (DASY5: 400 MHz, Intel Celeron), chipdisk (DASY5:128MB), RAM (DASY5:128MB). The necessary circuits for communication with the DAE electronic box, as well as the 16 bit AD converter system for optical detection and digital I/O interface are contained on the DASY I/O board, which is directly connected to the PC/104 bus of the CPU board.

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



Picture C.6 Server for DASY 5

C.4.4. Device Holder for Phantom

The SAR in the phantom is approximately inversely proportional to the square of the distance between the source and the liquid surface. For a source at 5mm distance, a positioning uncertainty of $\pm 0.5\text{mm}$ would produce a SAR uncertainty of $\pm 20\%$. Accurate device positioning is therefore crucial for accurate and repeatable measurements. The positions in which the devices must be measured are defined by the standards.

The DASY device holder is designed to cope with the different positions given in the standard. It has two scales for device rotation (with respect to the body axis) and device inclination (with respect to the line between the ear reference points). The rotation centers for both scales is the ear reference point (ERP). Thus the device needs no repositioning when changing the angles.

The DASY device holder is constructed of low-loss POM material having the following dielectric

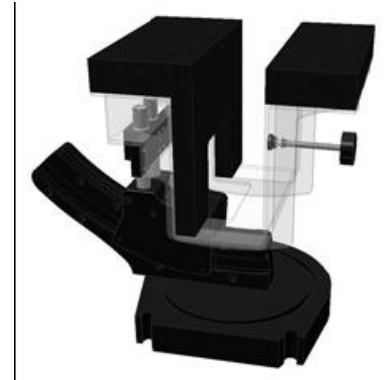
parameters: relative permittivity $\epsilon = 3$ and loss tangent $\delta = 0.02$. The amount of dielectric material has been reduced in the closest vicinity of the device, since measurements have suggested that the influence of the clamp on the test results could thus be lowered.

<Laptop Extension Kit>

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



Picture C.7-1: Device Holder



Picture C.7-2: Laptop Extension Kit

C.4.5. Phantom

The SAM Twin Phantom V4.0 is constructed of a fiberglass shell integrated in a table. The shape of the shell is based on data from an anatomical study designed to represent the 90th percentile of the population. The phantom enables the dissymmetric evaluation of SAR for both left and right handed handset usage, as well as body-worn usage using the flat phantom region. Reference markings on the Phantom allow the complete setup of all predefined phantom positions and measurement grids by manually teaching three points in the robot. The shell phantom has a 2mm shell thickness (except the ear region where shell thickness increases to 6 mm).

Shell Thickness: 2 ± 0.2 mm
Filling Volume: Approx. 25 liters
Dimensions: 810 x 1000 x 500 mm (H x L x W)
Available: Special

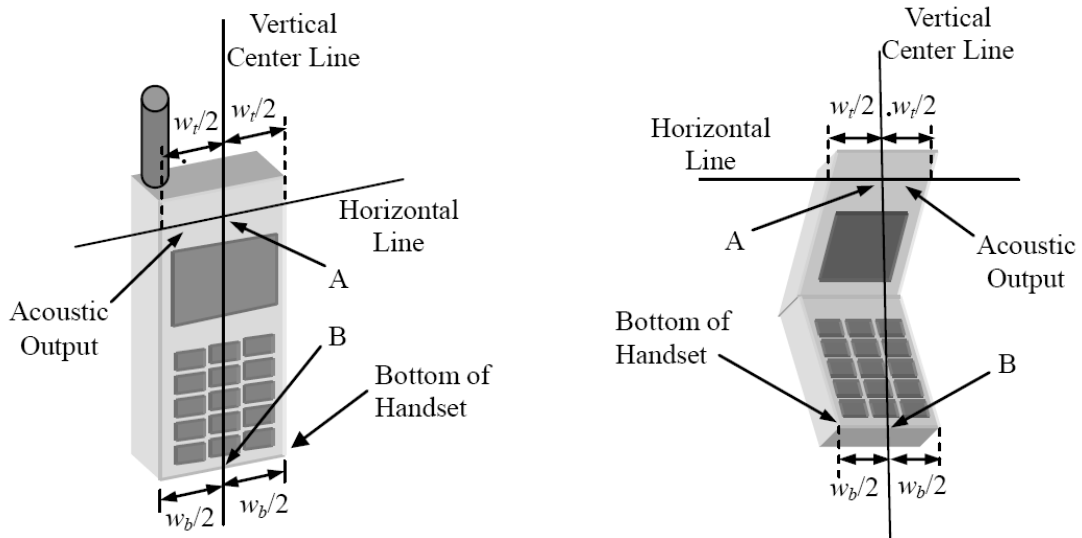


Picture C.8: SAM Twin Phantom

ANNEX D: Position of the wireless device in relation to the phantom

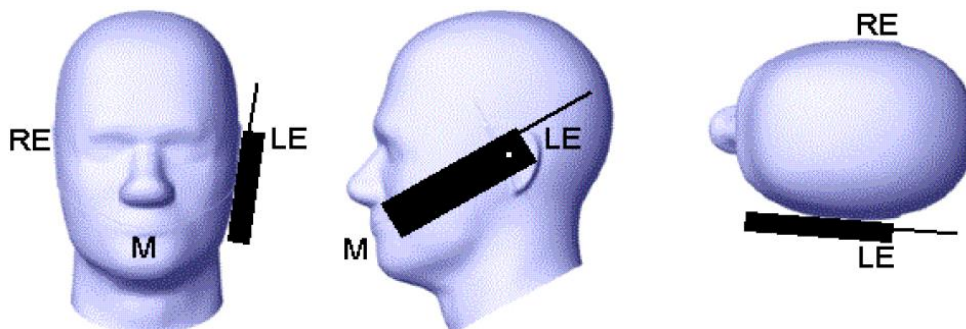
D.1. General considerations

This standard specifies two handset test positions against the head phantom – the “cheek” position and the “tilt” position.

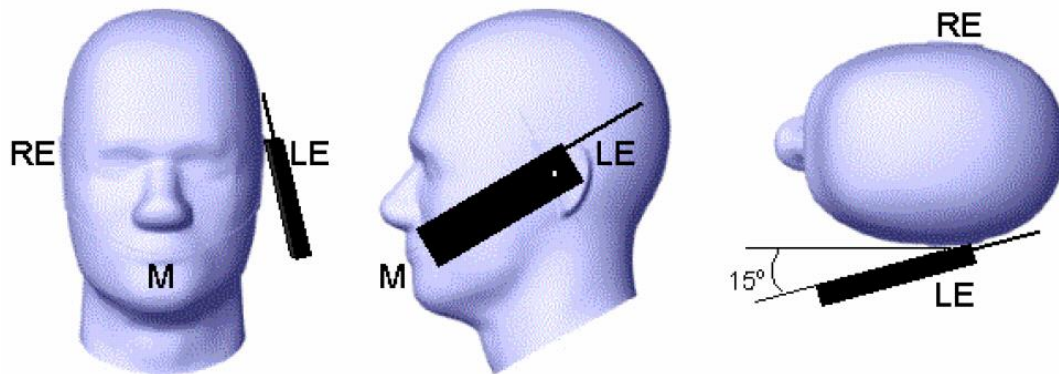


- w_t Width of the handset at the level of the acoustic
- w_b Width of the bottom of the handset
- A Midpoint of the width w_t of the handset at the level of the acoustic output
- B Midpoint of the width w_b of the bottom of the handset

Picture D.1-a Typical “fixed” case handset Picture D.1-b Typical “clam-shell” case handset



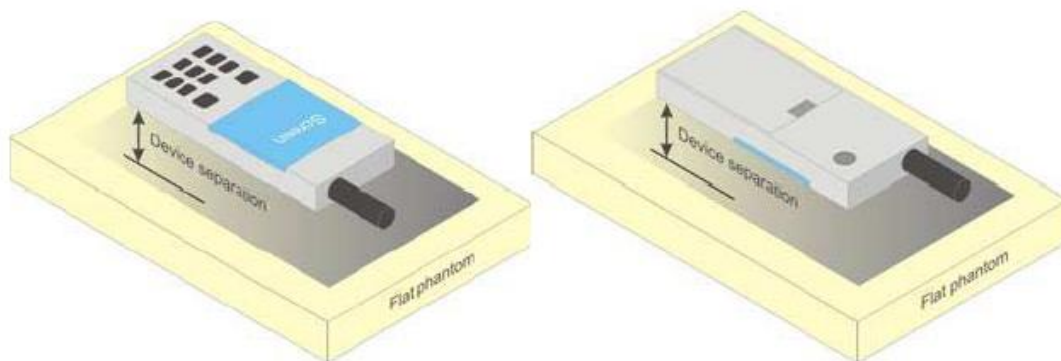
Picture D.2 Cheek position of the wireless device on the left side of SAM



Picture D.3 Tilt position of the wireless device on the left side of SAM

D.2. Body-worn device

A typical example of a body-worn device is a mobile phone, wireless enabled PDA or other battery operated wireless device with the ability to transmit while mounted on a person's body using a carry accessory approved by the wireless device manufacturer.

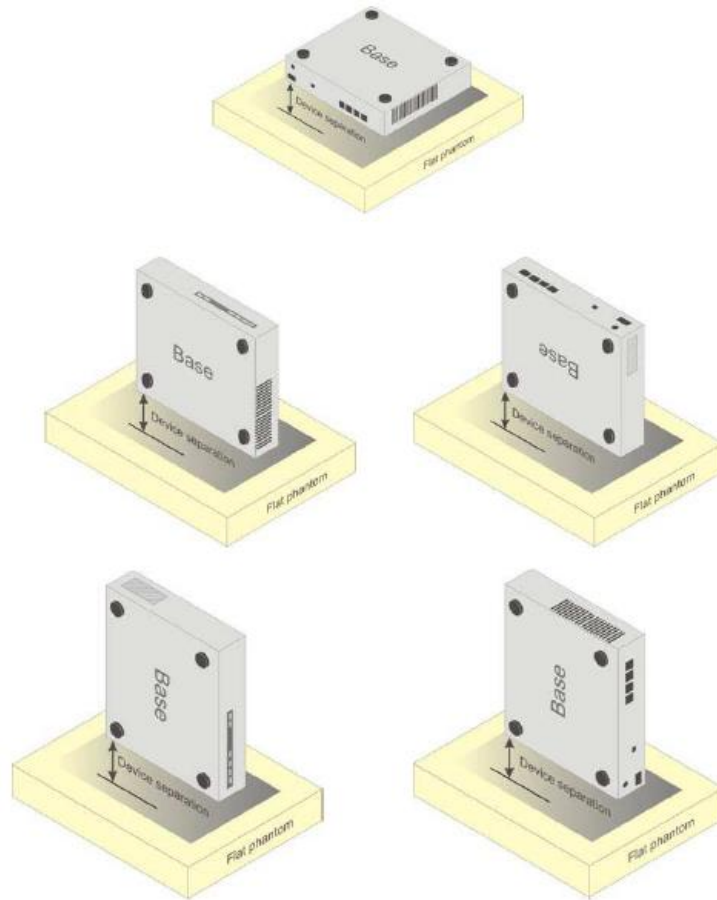


Picture D.4 Test positions for body-worn devices

D.3. Desktop device

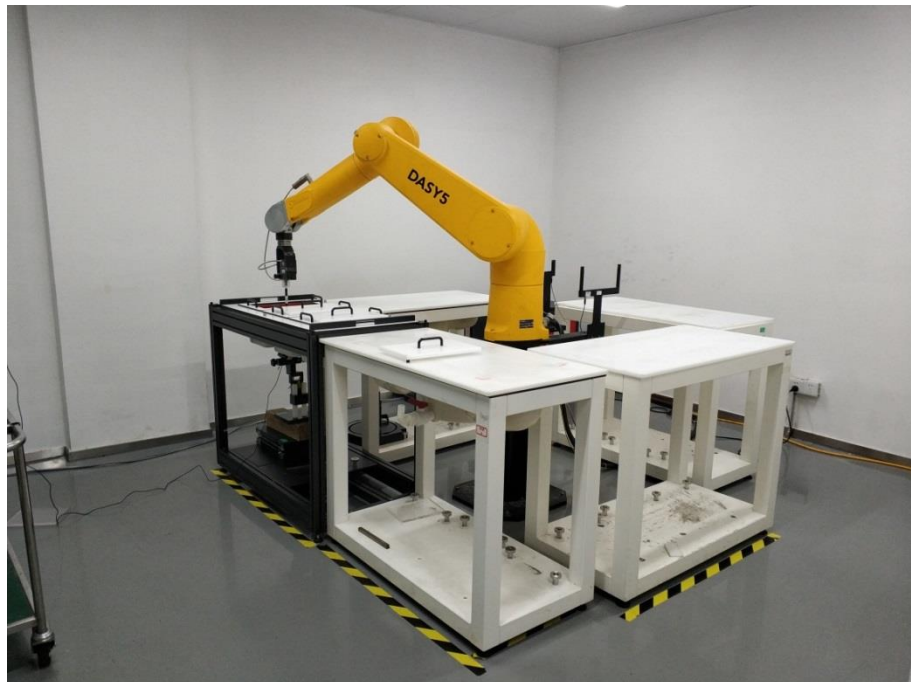
A typical example of a desktop device is a wireless enabled desktop computer placed on a table or desk when used.

The DUT shall be positioned at the distance and in the orientation to the phantom that corresponds to the intended use as specified by the manufacturer in the user instructions. For devices that employ an external antenna with variable positions, tests shall be performed for all antenna positions specified. Picture 8.5 show positions for desktop device SAR tests. If the intended use is not specified, the device shall be tested directly against the flat phantom.



Picture D.5 Test positions for desktop devices

D.4. DUT Setup Photos



Picture D.6

ANNEX E: Equivalent Media Recipes

The liquid used for the frequency range of 700-6000 MHz consisted of water, sugar, salt, preventol, glycol monobutyl and Cellulose. The liquid has been previously proven to be suited for worst-case. The Table E.1 shows the detail solution. It's satisfying the latest tissue dielectric parameters requirements proposed by the IEEE 1528 and IEC 62209.

Table E.1: Composition of the Tissue Equivalent Matter

Frequency (MHz)	835	1750	1900	2450	2600	5200	5800
Water	41.45	55.242	55.242	58.79	58.79	65.53	66.10
Sugar	56.0	/	/	/	/	/	/
Salt	1.45	0.306	0.306	0.06	0.06		
Preventol	0.1	/	/	/	/	17.24	16.95
Cellulose	1.0	/	/	/	/	17.24	16.95
Glycol Monobutyl	/	44.452	44.452	41.15	41.15	/	/
Diethylenglycol monohexylether	/	/	/	/	/	/	/
Triton X-100	/	/	/	/	/	/	/
Dielectric Parameters Target Value	$\epsilon=41.5$ $\sigma=0.90$	$\epsilon=40.08$ $\sigma=1.37$	$\epsilon=40.0$ $\sigma=1.40$	$\epsilon=39.20$ $\sigma=1.80$	$\epsilon=39.01$ $\sigma=1.96$	$\epsilon=35.99$ $\sigma=4.66$	$\epsilon=35.30$ $\sigma=5.27$

Note: There is a little adjustment respectively for 750, 5300 and 5600, based on the recipe of closest frequency in table E.1

ANNEX F: System Validation

The SAR system must be validated against its performance specifications before it is deployed. When SAR probes, system components or software are changed, upgraded or recalibrated, these must be validated with the SAR system(s) that operates with such components.

Table F.1: System Validation

Probe SN.	Liquid name (MHz)	Validation date	Frequency point	CW Validation	Modulation Signal Validation		
					Modulation Type	Duty Factor	PAR
7621	Head 750	2022-05-09	750MHz	Pass	N/A	N/A	N/A
7621	Head 835	2022-05-09	835MHz	Pass	GMSK	Pass	N/A
7621	Head 1750	2022-05-09	1750MHz	Pass	N/A	N/A	N/A
7621	Head 1900	2022-05-09	1900MHz	Pass	GMSK	Pass	N/A
7621	Head 2450	2022-05-08	2450MHz	Pass	OFDM/TDD	Pass	Pass
7621	Head 2550	2022-05-08	2550MHz	Pass	TDD	Pass	N/A
7621	Head 3500	2022-05-10	3500MHz	Pass	TDD	Pass	N/A
7621	Head 3700	2022-05-10	3700MHz	Pass	TDD	Pass	N/A
7621	Head 3900	2022-05-10	3900MHz	Pass	TDD	Pass	N/A
7621	Head 5250	2022-05-08	5250MHz	Pass	OFDM	N/A	Pass
7621	Head 5600	2022-05-08	5600MHz	Pass	OFDM	N/A	Pass
7621	Head 5750	2022-05-08	5750MHz	Pass	OFDM	N/A	Pass
7683	Head 750	2023-02-20	750MHz	Pass	N/A	N/A	N/A
7683	Head 835	2023-02-20	835MHz	Pass	GMSK	Pass	N/A
7683	Head 1750	2023-02-20	1750MHz	Pass	N/A	N/A	N/A
7683	Head 1900	2023-02-20	1900MHz	Pass	GMSK	Pass	N/A
7683	Head 2450	2023-02-22	2450MHz	Pass	OFDM/TDD	Pass	Pass
7683	Head 2550	2023-02-20	2550MHz	Pass	TDD	Pass	N/A
7683	Head 3500	2023-02-21	3500MHz	Pass	TDD	Pass	N/A
7683	Head 3700	2023-02-21	3700MHz	Pass	TDD	Pass	N/A
7683	Head 3900	2023-02-21	3900MHz	Pass	TDD	Pass	N/A
7683	Head 5250	2023-02-22	5250MHz	Pass	OFDM	N/A	Pass
7683	Head 5600	2023-02-22	5600MHz	Pass	OFDM	N/A	Pass
7683	Head 5750	2023-02-22	5750MHz	Pass	OFDM	N/A	Pass

ANNEX G: DAE Calibration Certificate

DAE4-SN: 1527

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



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

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

Accreditation No.: SCS 0108

Client **Saict-SZ (Auden)**

Certificate No: **DAE4-1527_Jun22**

CALIBRATION CERTIFICATE

Object **DAE4 - SD 000 D04 BM - SN: 1527**

Calibration procedure(s) **QA CAL-06.v30
Calibration procedure for the data acquisition electronics (DAE)**



Calibration date: **June 21, 2022**

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

All calibrations have been conducted in the closed laboratory facility: environment temperature $(22 \pm 3)^{\circ}\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Keithley Multimeter Type 2001	SN: 0810278	31-Aug-21 (No:31366)	Aug-22
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Auto DAE Calibration Unit	SE UWS 053 AA 1001	24-Jan-22 (in house check)	In house check; Jan-23
Calibrator Box V2.1	SE UMS 006 AA 1002	24-Jan-22 (in house check)	In house check; Jan-23

Calibrated by:	Name Adrian Gehring	Function Laboratory Technician	Signature 
Approved by:	Sven Kühn	Technical Manager	

Issued: June 21, 2022

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

**Calibration Laboratory of
Schmid & Partner
Engineering AG**
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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Glossary

DAE data acquisition electronics.
Connector angle information used in DASY system to align probe sensor X to the robot coordinate system.

Methods Applied and Interpretation of Parameters

- **DC Voltage Measurement:** Calibration Factor assessed for use in DASY system by comparison with a calibrated instrument traceable to national standards. The figure given corresponds to the full scale range of the voltmeter in the respective range.
- **Connector angle:** The angle of the connector is assessed measuring the angle mechanically by a tool inserted. Uncertainty is not required.
- The following parameters as documented in the Appendix contain technical information as a result from the performance test and require no uncertainty.
 - **DC Voltage Measurement Linearity:** Verification of the Linearity at +10% and -10% of the nominal calibration voltage. Influence of offset voltage is included in this measurement.
 - **Common mode sensitivity:** Influence of a positive or negative common mode voltage on the differential measurement.
 - **Channel separation:** Influence of a voltage on the neighbor channels not subject to an input voltage.
 - **AD Converter Values with inputs shorted:** Values on the internal AD converter corresponding to zero input voltage
 - **Input Offset Measurement:** Output voltage and statistical results over a large number of zero voltage measurements.
 - **Input Offset Current:** Typical value for information; Maximum channel input offset current, not considering the input resistance.
 - **Input resistance:** Typical value for information: DAE input resistance at the connector, during internal auto-zeroing and during measurement.
 - **Low Battery Alarm Voltage:** Typical value for information. Below this voltage, a battery alarm signal is generated.
 - **Power consumption:** Typical value for information. Supply currents in various operating modes.

DC Voltage Measurement

AD - Converter Resolution nominal

High Range: 1LSB = 6.1µV , full range = -100...+300 mV

Low Range: 1LSB = 61nV , full range = -1.....+3mV

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

Calibration Factors	X	Y	Z
High Range	403.865 ± 0.02% (k=2)	403.595 ± 0.02% (k=2)	403.805 ± 0.02% (k=2)
Low Range	3.95898 ± 1.50% (k=2)	3.98939 ± 1.50% (k=2)	3.96763 ± 1.50% (k=2)

Connector Angle

Connector Angle to be used in DASY system	61.0 ° ± 1 °
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Appendix (Additional assessments outside the scope of SCS0108)
1. DC Voltage Linearity

High Range	Reading (μV)	Difference (μV)	Error (%)
Channel X + Input	200037.59	1.98	0.00
Channel X + Input	20007.61	1.34	0.01
Channel X - Input	-20004.09	1.79	-0.01
Channel Y + Input	200037.45	1.53	0.00
Channel Y + Input	20002.68	-3.42	-0.02
Channel Y - Input	-20007.17	-1.14	0.01
Channel Z + Input	200037.73	2.17	0.00
Channel Z + Input	20005.72	-0.34	-0.00
Channel Z - Input	-20006.63	-0.49	0.00

Low Range	Reading (μV)	Difference (μV)	Error (%)
Channel X + Input	2001.36	-0.15	-0.01
Channel X + Input	201.70	0.16	0.08
Channel X - Input	-198.10	0.49	-0.24
Channel Y + Input	2001.44	0.07	0.00
Channel Y + Input	201.07	-0.21	-0.11
Channel Y - Input	-199.66	-0.98	0.50
Channel Z + Input	2001.52	0.21	0.01
Channel Z + Input	200.81	-0.41	-0.20
Channel Z - Input	-199.00	-0.15	0.07

2. Common mode sensitivity

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Common mode Input Voltage (mV)	High Range Average Reading (μV)	Low Range Average Reading (μV)
Channel X	200	-3.95	-5.31
	- 200	5.96	4.97
Channel Y	200	-16.18	-16.25
	- 200	14.41	14.34
Channel Z	200	3.01	2.86
	- 200	-3.93	-4.13

3. Channel separation

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Input Voltage (mV)	Channel X (μV)	Channel Y (μV)	Channel Z (μV)
Channel X	200	-	-0.68	-2.76
Channel Y	200	5.43	-	-0.31
Channel Z	200	10.73	3.29	-

4. AD-Converter Values with inputs shorted

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	High Range (LSB)	Low Range (LSB)
Channel X	16059	17078
Channel Y	15965	16219
Channel Z	15888	13556

5. Input Offset Measurement

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

Input 10M Ω

	Average (μ V)	min. Offset (μ V)	max. Offset (μ V)	Std. Deviation (μ V)
Channel X	1.40	0.30	2.25	0.35
Channel Y	-0.62	-1.30	0.47	0.33
Channel Z	-0.18	-0.90	0.60	0.31

6. Input Offset Current

Nominal Input circuitry offset current on all channels: <25fA

7. Input Resistance (Typical values for information)

	Zeroing (kOhm)	Measuring (MOhm)
Channel X	200	200
Channel Y	200	200
Channel Z	200	200

8. Low Battery Alarm Voltage (Typical values for information)

Typical values	Alarm Level (VDC)
Supply (+ Vcc)	+7.9
Supply (- Vcc)	-7.6

9. Power Consumption (Typical values for information)

Typical values	Switched off (mA)	Stand by (mA)	Transmitting (mA)
Supply (+ Vcc)	+0.01	+6	+14
Supply (- Vcc)	-0.01	-8	-9

DAE4-SN: 1790

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



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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **SAICT-SZ**

Certificate No: **DAE4-1790_Mar23**

CALIBRATION CERTIFICATE

Object **DAE4 - SD 000 D04 BP - SN: 1790**

Calibration procedure(s) **QA CAL-06.v30
Calibration procedure for the data acquisition electronics (DAE)**



Calibration date: **March 02, 2023**

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Kelthley Multimeter Type 2001	SN: 0810278	29-Aug-22 (No:34389)	Aug-23
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Auto DAE Calibration Unit	SE UWS 053 AA 1001	27-Jan-23 (in house check)	In house check: Jan-24
Calibrator Box V2.1	SE UMS 006 AA 1002	27-Jan-23 (in house check)	In house check: Jan-24

Calibrated by:	Name Eric Hainfeld	Function Laboratory Technician	Signature 
Approved by:	Name Sven Kühn	Function Technical Manager	Signature 

Issued: March 2, 2023

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Glossary

DAE data acquisition electronics
Connector angle information used in DASY system to align probe sensor X to the robot coordinate system.

Methods Applied and Interpretation of Parameters

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 - **Low Battery Alarm Voltage:** Typical value for information. Below this voltage, a battery alarm signal is generated.
 - **Power consumption:** Typical value for information. Supply currents in various operating modes.

DC Voltage Measurement

A/D - Converter Resolution nominal

High Range: 1LSB = 6.1μV, full range = -100...+300 mV

Low Range: 1LSB = 61nV, full range = -1.....+3mV

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

Calibration Factors	X	Y	Z
High Range	404.604 ± 0.02% (k=2)	404.331 ± 0.02% (k=2)	404.468 ± 0.02% (k=2)
Low Range	4.00255 ± 1.50% (k=2)	3.99549 ± 1.50% (k=2)	3.98581 ± 1.50% (k=2)

Connector Angle

Connector Angle to be used in DASY system	306.0 ° ± 1 °
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Appendix (Additional assessments outside the scope of SCS0108)

1. DC Voltage Linearity

High Range	Reading (μV)	Difference (μV)	Error (%)
Channel X + Input	200033.74	-1.44	-0.00
Channel X + Input	20005.39	-0.74	-0.00
Channel X - Input	-20004.02	1.76	-0.01
Channel Y + Input	200038.50	3.58	0.00
Channel Y + Input	20002.97	-3.15	-0.02
Channel Y - Input	-20007.14	-1.18	0.01
Channel Z + Input	200034.20	-0.88	-0.00
Channel Z + Input	20004.41	-1.63	-0.01
Channel Z - Input	-20005.73	0.32	-0.00

Low Range	Reading (μV)	Difference (μV)	Error (%)
Channel X + Input	2001.40	-0.14	-0.01
Channel X + Input	200.82	-0.59	-0.29
Channel X - Input	-198.28	0.23	-0.12
Channel Y + Input	2001.39	-0.05	-0.00
Channel Y + Input	200.26	-1.03	-0.51
Channel Y - Input	-199.92	-1.28	0.65
Channel Z + Input	2001.20	-0.22	-0.01
Channel Z + Input	200.40	-0.89	-0.44
Channel Z - Input	-199.63	-1.02	0.51

2. Common mode sensitivity

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Common mode Input Voltage (mV)	High Range Average Reading (μV)	Low Range Average Reading (μV)
Channel X	200	-18.43	-19.65
	-200	19.32	18.11
Channel Y	200	-17.38	-18.13
	-200	16.56	16.01
Channel Z	200	-11.31	-11.64
	-200	10.03	9.99

3. Channel separation

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Input Voltage (mV)	Channel X (μV)	Channel Y (μV)	Channel Z (μV)
Channel X	200	-	0.84	-2.57
Channel Y	200	4.84	-	3.21
Channel Z	200	7.42	2.89	-

4. AD-Converter Values with inputs shorted

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	High Range (LSB)	Low Range (LSB)
Channel X	16203	15690
Channel Y	16275	16445
Channel Z	15950	16110

5. Input Offset Measurement

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

Input 10MΩ

	Average (μV)	min. Offset (μV)	max. Offset (μV)	Std. Deviation (μV)
Channel X	0.10	-1.05	1.63	0.45
Channel Y	-0.42	-2.31	0.79	0.40
Channel Z	-0.67	-1.34	0.29	0.34

6. Input Offset Current

Nominal input circuitry offset current on all channels: <25fA

7. Input Resistance (Typical values for information)

	Zeroing (kOhm)	Measuring (MOhm)
Channel X	200	200
Channel Y	200	200
Channel Z	200	200

8. Low Battery Alarm Voltage (Typical values for information)

Typical values	Alarm Level (VDC)
Supply (+ Vcc)	+7.9
Supply (- Vcc)	-7.6

9. Power Consumption (Typical values for information)

Typical values	Switched off (mA)	Stand by (mA)	Transmitting (mA)
Supply (+ Vcc)	+0.01	+6	+14
Supply (- Vcc)	-0.01	-8	-9

ANNEX H: Probe Calibration Certificate

EX3DV4-SN: 7621



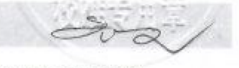


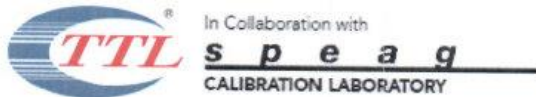
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 E-mail: cttl@chinattl.com http://www.caict.ac.cn



Client SAICT

Certificate No: Z22-60124

CALIBRATION CERTIFICATE			
Object	EX3DV4 - SN : 7621		
Calibration Procedure(s)	FF-Z11-004-02 Calibration Procedures for Dosimetric E-field Probes		
Calibration date:	May 06, 2022		
<p>This calibration Certificate documents the traceability to national standards, which realize the physical units of measurements(SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.</p> <p>All calibrations have been conducted in the closed laboratory facility: environment temperature(22±3)°C and humidity<70%.</p> <p>Calibration Equipment used (M&TE critical for calibration)</p>			
Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	101919	15-Jun-21(CTTL, No.J21X04466)	Jun-22
Power sensor NRP-Z91	101547	15-Jun-21(CTTL, No.J21X04466)	Jun-22
Power sensor NRP-Z91	101548	15-Jun-21(CTTL, No.J21X04466)	Jun-22
Reference 10dBAAttenuator	18N50W-10dB	20-Jan-21(CTTL, No.J21X00486)	Jan-23
Reference 20dBAAttenuator	18N50W-20dB	20-Jan-21(CTTL, No.J21X00485)	Jan-23
Reference Probe EX3DV4	SN 7464	26-Jan-22(SPEAG, No.EX3-7464_Jan22)	Jan-23
DAE4	SN 1555	20-Aug-21(SPEAG, No.DAE4-1555_Aug21/2)	Aug-22
Secondary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
SignalGenerator MG3700A	6201052605	16-Jun-21(CTTL, No.J21X04467)	Jun-22
Network Analyzer E5071C	MY46110673	14-Jan-22(CTTL, No.J22X00406)	Jan-23
Calibrated by:	Name Yu Zongying	Function SAR Test Engineer	Signature 
Reviewed by:	Name Lin Hao	Function SAR Test Engineer	Signature 
Approved by:	Name Qi Dianyuan	Function SAR Project Leader	Signature 
Issued: May 23, 2022			
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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), i $\theta=0$ 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.
- DCP_{x,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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DASY/EASY – Parameters of Probe: EX3DV4 – SN:7621

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm($\mu\text{V}/(\text{V}/\text{m})^2$) ^A	0.71	0.71	0.56	$\pm 10.0\%$
DCP(mV) ^B	111.7	111.8	115.7	

Modulation Calibration Parameters

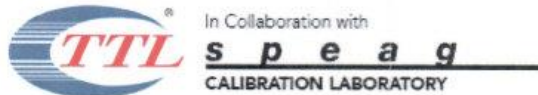
UID	Communication System Name		A dB	B dB· μV	C	D dB	VR mV	Unc ^E (k=2)
0	CW	X	0.0	0.0	1.0	0.00	210.8	$\pm 3.5\%$
		Y	0.0	0.0	1.0		218.6	
		Z	0.0	0.0	1.0		190.8	

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 E^2 -field uncertainty inside TSL (see Page 4).

^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:7621

Calibration Parameter Determined in Head Tissue Simulating Media

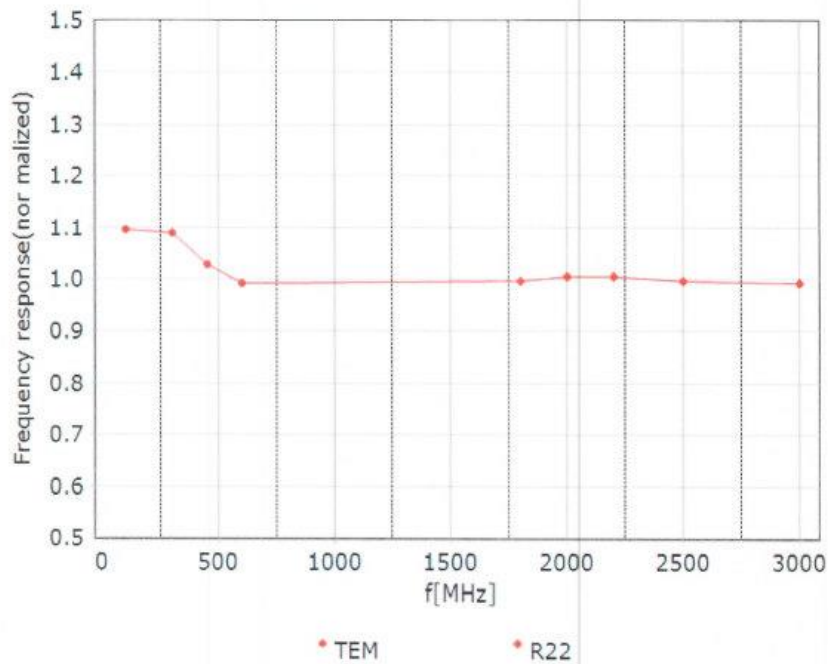
f [MHz] ^C	Relative Permittivity ^F	Conductivity (S/m) ^F	ConvF X	ConvF Y	ConvF Z	Alpha ^G	Depth ^G (mm)	Unct. (k=2)
750	41.9	0.89	11.12	11.12	11.12	0.18	1.14	±12.1%
900	41.5	0.97	10.68	10.68	10.68	0.14	1.14	±12.1%
1450	40.5	1.20	9.65	9.65	9.65	0.21	0.91	±12.1%
1750	40.1	1.37	9.22	9.22	9.22	0.31	0.90	±12.1%
1900	40.0	1.40	8.90	8.90	8.90	0.35	0.84	±12.1%
2100	39.8	1.49	8.95	8.95	8.95	0.23	1.13	±12.1%
2300	39.5	1.67	8.60	8.60	8.60	0.44	0.78	±12.1%
2450	39.2	1.80	8.17	8.17	8.17	0.49	0.78	±12.1%
2600	39.0	1.96	7.93	7.93	7.93	0.51	0.75	±12.1%
3300	38.2	2.71	7.74	7.74	7.74	0.45	0.92	±13.3%
3500	37.9	2.91	7.56	7.56	7.56	0.44	1.00	±13.3%
3700	37.7	3.12	7.18	7.18	7.18	0.38	1.05	±13.3%
3900	37.5	3.32	7.26	7.26	7.26	0.35	1.35	±13.3%
4100	37.2	3.53	7.21	7.21	7.21	0.25	1.30	±13.3%
4400	36.9	3.84	7.01	7.01	7.01	0.25	1.55	±13.3%
4600	36.7	4.04	6.90	6.90	6.90	0.30	1.72	±13.3%
4800	36.4	4.25	6.79	6.79	6.79	0.30	1.85	±13.3%
4950	36.3	4.40	6.44	6.44	6.44	0.30	1.80	±13.3%
5250	35.9	4.71	5.98	5.98	5.98	0.35	1.63	±13.3%
5600	35.5	5.07	5.47	5.47	5.47	0.40	1.55	±13.3%
5750	35.4	5.22	5.40	5.40	5.40	0.40	1.55	±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.

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

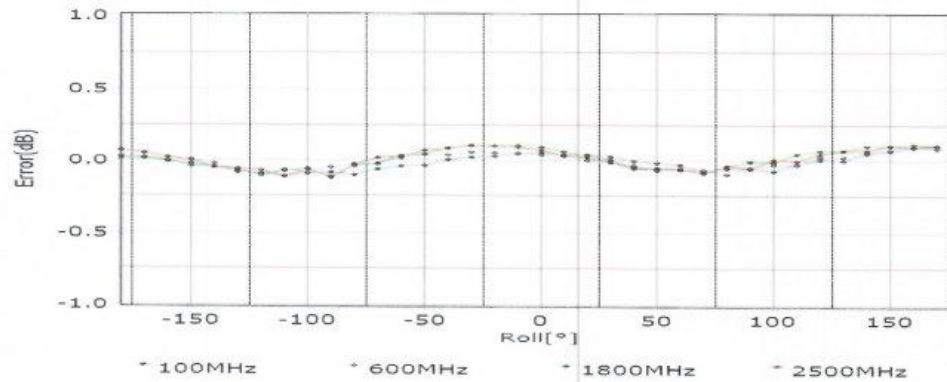
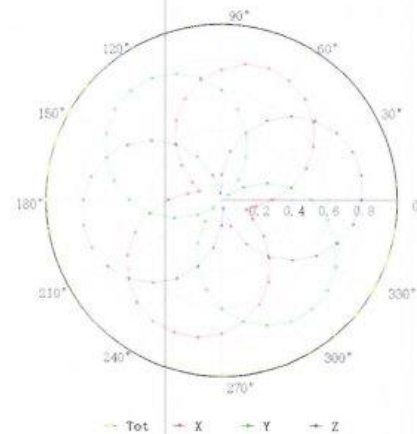
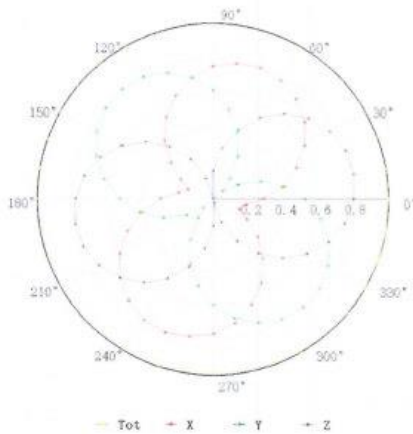


Uncertainty of Frequency Response of E-field: $\pm 7.4\%$ ($k=2$)

Receiving Pattern (Φ), $\theta=0^\circ$

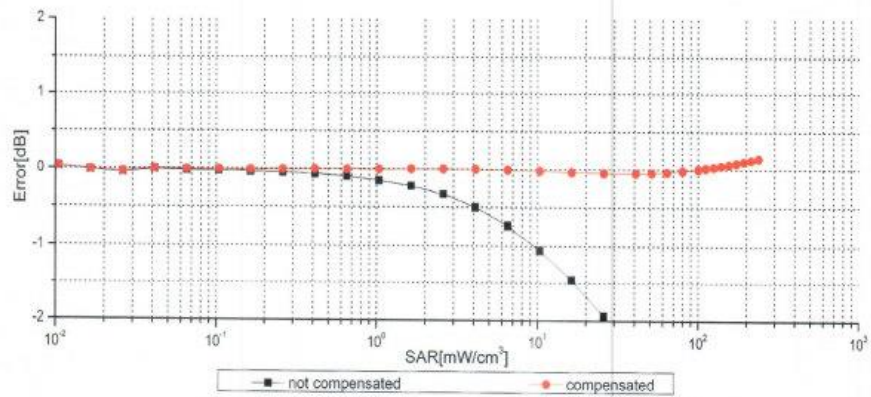
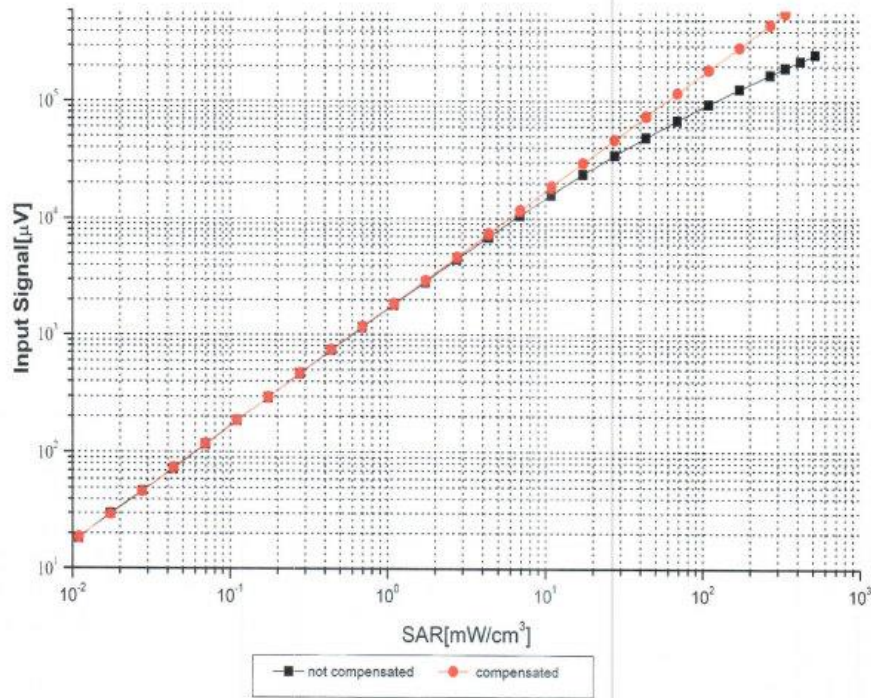
f=600 MHz, TEM

f=1800 MHz, R22



Uncertainty of Axial Isotropy Assessment: $\pm 1.2\%$ ($k=2$)

Dynamic Range f(SAR_{head}) (TEM cell, f = 900 MHz)

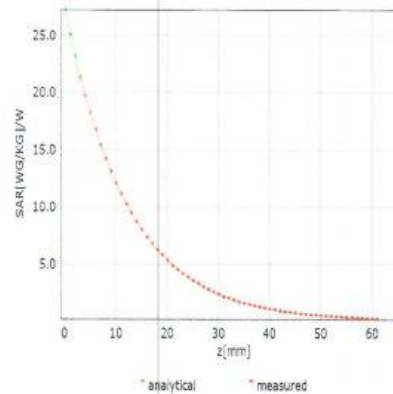
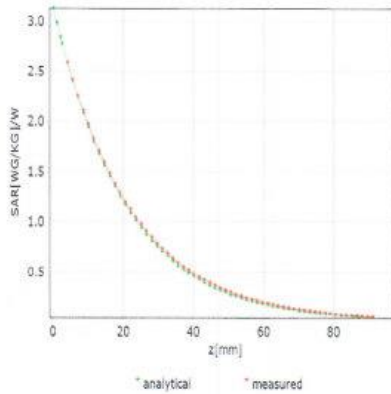


Uncertainty of Linearity Assessment: ±0.9% (k=2)

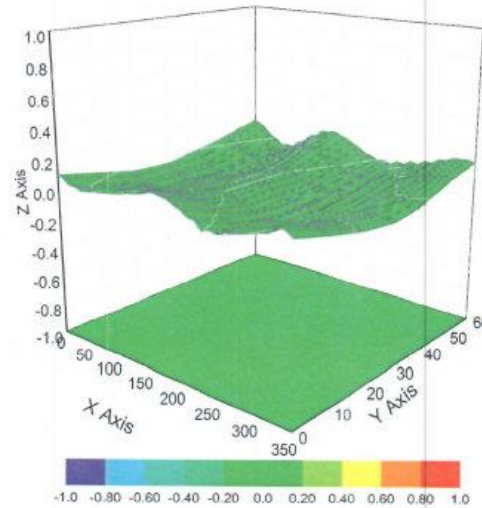
Conversion Factor Assessment

f=750 MHz,WGLS R9(H_convF)

f=1750 MHz,WGLS R22(H_convF)



Deviation from Isotropy in Liquid



Uncertainty of Spherical Isotropy Assessment: $\pm 3.2\%$ ($k=2$)

DASY/EASY – Parameters of Probe: EX3DV4 – SN:7621

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	95.4
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disable
Probe Overall Length	337mm
Probe Body Diameter	10mm
Tip Length	9mm
Tip Diameter	2.5mm
Probe Tip to Sensor X Calibration Point	1mm
Probe Tip to Sensor Y Calibration Point	1mm
Probe Tip to Sensor Z Calibration Point	1mm
Recommended Measurement Distance from Surface	1.4mm



EX3DV4-SN: 7683



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Client SAICT

Certificate No: Z23-60028

CALIBRATION CERTIFICATE			
Object	EX3DV4 - SN : 7683		
Calibration Procedure(s)	FF-Z11-004-02 Calibration Procedures for Dosimetric E-field Probes		
Calibration date:	February 16, 2023		
This calibration Certificate documents the traceability to national standards, which realize the physical units of measurements(SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.			
All calibrations have been conducted in the closed laboratory facility: environment temperature(22±3)°C and humidity<70%.			
Calibration Equipment used (M&TE critical for calibration)			
Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	101919	14-Jun-22(CTTL, No.J22X04181)	Jun-23
Power sensor NRP-Z91	101547	14-Jun-22(CTTL, No.J22X04181)	Jun-23
Power sensor NRP-Z91	101548	14-Jun-22(CTTL, No.J22X04181)	Jun-23
Reference 10dBAttenuator	18N50W-10dB	19-Jan-23(CTTL, No.J23X00212)	Jan-25
Reference 20dBAttenuator	18N50W-20dB	19-Jan-23(CTTL, No.J23X00211)	Jan-25
Reference Probe EX3DV4	SN 3846	20-May-22(SPEAG, No.EX3-3846_May22)	May-23
DAE4	SN 771	20-Jan-22(SPEAG, No.DAE4-771_Jan22)	Jan-23
DAE4	SN 1555	25-Aug-22(SPEAG, No.DAE4-1555_Aug22)	Aug-23
Secondary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
SignalGenerator MG3700A	6201052605	14-Jun-22(CTTL, No.J22X04182)	Jun-23
Network Analyzer E5071C	MY46110673	10-Jan-23(CTTL, No.J23X00104)	Jan-24
Calibrated by:	Name Yu Zongying	Function SAR Test Engineer	Signature
Reviewed by:	Name Lin Hao	Function SAR Test Engineer	Signature
Approved by:	Name Qi Dianyuan	Function SAR Project Leader	Signature
Issued: February 21, 2023			
This calibration certificate shall not be reproduced except in full without written approval of the laboratory.			



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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 $\theta=0$ ($f \leq 900$ MHz in TEM-cell; $f > 1800$ 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.
- DCP_{x,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 $f \leq 800$ MHz) and inside waveguide using analytical field distributions based on power measurements for $f > 800$ MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty 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 ± 50 MHz to ± 100 MHz.
- Spherical isotropy (3D deviation from isotropy)**: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- Sensor Offset**: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- Connector Angle**: The angle is assessed using the information gained by determining the NORM_x (no uncertainty required).