ANNEX

of

No. 23T04Z70553-07

For

SAMSUNG Electronics Co., Ltd.

Multi-band GSM/WCDMA/LTE phone with Bluetooth, WLAN

Model Name: SM-A057M/DS，SM-A057M

with

Hardware Version: REV1.0

Software Version: A057M.001

FCC ID: ZCASMA057M

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 CTTL.

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ANNEX A Graph Results
GSM 850 Head

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Duty Cycle	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
LeftHead, HSL	CHEEK, 0.00	GSM 850	1:4	848.800, 251	10.31	0.950	41.788

Hardware Setup

Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Twin-SAM V8.0 (30deg probe tilt) - 2114	HBBL-600-10000	EX3DV4 - SN7727, 2023-06-05	DAE4 Sn1807, 2023-05-15

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	120.0 x 210.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	15.0 x 15.0	6.0 x 6.0 x 1.5
Sensor Surface [mm]	3.0	1.4
Graded Grid	N/A	Yes
Grading Ratio	N/A	1.5
MAIA	N/A	N/A
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-10-17	2023-10-17
psSAR1g [W/kg]	0.300	0.329
psSAR10g [W/kg]	0.207	0.245
Power Drift [dB]	-0.04	-0.01
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		86.2
Dist 3dB Peak [mm]		> 15.0

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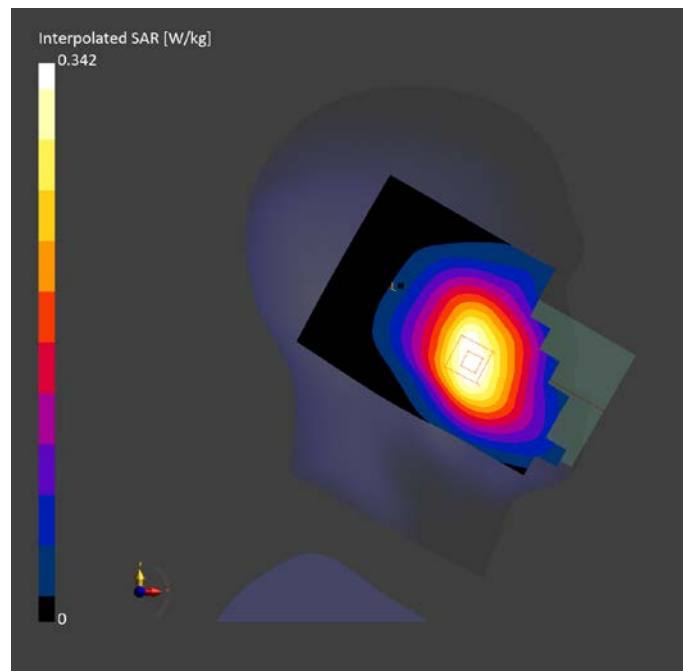
GSM 850 Body

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Duty Cycle	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	BACK, 10.00	GSM 850	1:4	848.800, 251	10.31	0.950	40.788

Hardware Setup

Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Twin-SAM V8.0 (30deg probe tilt) - 2114	HBBL-600-10000	EX3DV4 - SN7727, 2023-06-05	DAE4 Sn1807, 2023-05-15

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	120.0 x 210.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	15.0 x 15.0	6.0 x 6.0 x 1.5
Sensor Surface [mm]	3.0	1.4
Graded Grid	N/A	Yes
Grading Ratio	N/A	1.5
MAIA	N/A	N/A
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-10-17	2023-10-17
psSAR1g [W/kg]	0.629	0.636
psSAR10g [W/kg]	0.402	0.373
Power Drift [dB]	-0.07	-0.06
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		79.3
Dist 3dB Peak [mm]		12.6
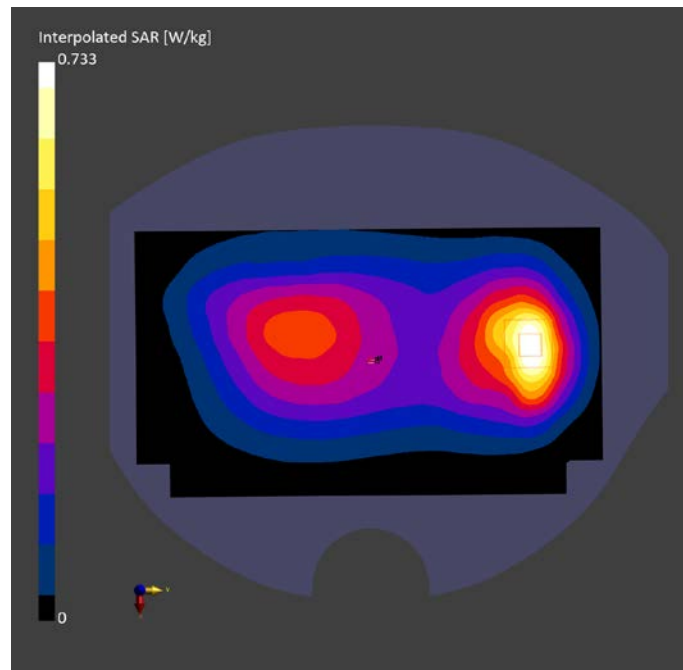
GSM 1900 Head

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Duty Cycle	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
LeftHead, HSL	CHEEK, 0.00	PCS 1900	1:4	1850.200, 512	8.47	1.417	40.29

Hardware Setup

Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Twin-SAM V8.0 (30deg probe tilt) - 2114	HBBL-600-10000	EX3DV4 - SN7727, 2023-06-05	DAE4 Sn1807, 2023-05-15

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	120.0 x 210.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	15.0 x 15.0	6.0 x 6.0 x 1.5
Sensor Surface [mm]	3.0	1.4
Graded Grid	N/A	Yes
Grading Ratio	N/A	1.5
MAIA	Y	Y
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-10-20	2023-10-20
psSAR1g [W/kg]	0.094	0.096
psSAR10g [W/kg]	0.057	0.062
Power Drift [dB]	-0.03	0.05
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		88.2
Dist 3dB Peak [mm]		15.8
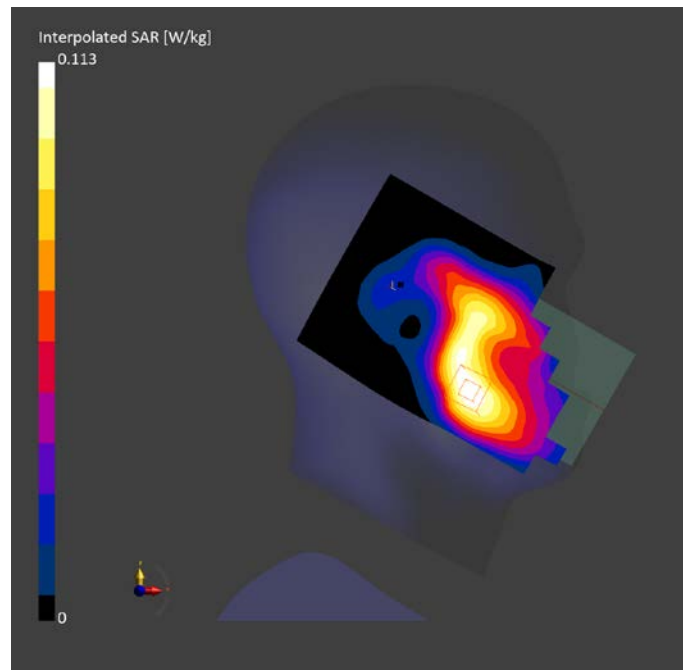
GSM 1900 Body

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Duty Cycle	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	BACK, 10.00	PCS 1900	1:4	1850.200, 512	8.47	1.417	40.29

Hardware Setup

Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Twin-SAM V8.0 (30deg probe tilt) - 2114	HBBL-600-10000	EX3DV4 - SN7727, 2023-06-05	DAE4 Sn1807, 2023-05-15

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	120.0 x 210.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	15.0 x 15.0	6.0 x 6.0 x 1.5
Sensor Surface [mm]	3.0	1.4
Graded Grid	N/A	Yes
Grading Ratio	N/A	1.5
MAIA	N/A	N/A
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-10-20	2023-10-20
psSAR1g [W/kg]	0.411	0.428
psSAR10g [W/kg]	0.233	0.246
Power Drift [dB]	-0.12	-0.08
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		83.0
Dist 3dB Peak [mm]		10.8
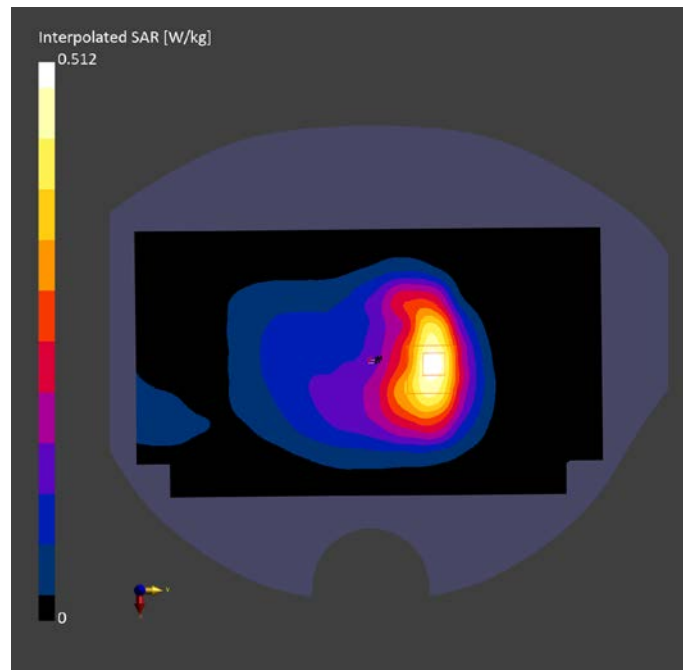
WCDMA 1900 Head

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Duty Cycle	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
LeftHead, HSL	CHEEK, 0.00	Band 2	1:1	1880.000, 9400	8.47	1.437	40.263

Hardware Setup

Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Twin-SAM V8.0 (30deg probe tilt) - 2114	HBBL-600-10000	EX3DV4 - SN7727, 2023-06-05	DAE4 Sn1807, 2023-05-15

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	120.0 x 210.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	15.0 x 15.0	6.0 x 6.0 x 1.5
Sensor Surface [mm]	3.0	1.4
Graded Grid	N/A	Yes
Grading Ratio	N/A	1.5
MAIA	Y	Y
Surface Detection	All points	All points
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-10-20	2023-10-20
psSAR1g [W/kg]	0.146	0.150
psSAR10g [W/kg]	0.086	0.093
Power Drift [dB]	-0.02	-0.03
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		83.5
Dist 3dB Peak [mm]		14.0
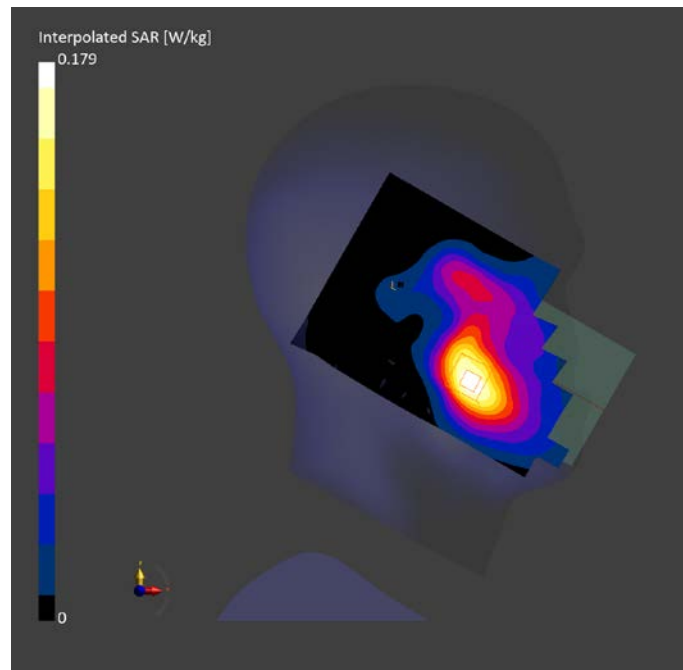
WCDMA 1900 Body

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Duty Cycle	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	BACK, 10.00	Band 2	1:1	1852.400, 9262	8.47	1.417	40.29

Hardware Setup

Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Twin-SAM V8.0 (30deg probe tilt) - 2114	HBBL-600-10000	EX3DV4 - SN7727, 2023-06-05	DAE4 Sn1807, 2023-05-15

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	120.0 x 210.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	15.0 x 15.0	6.0 x 6.0 x 1.5
Sensor Surface [mm]	3.0	1.4
Graded Grid	N/A	Yes
Grading Ratio	N/A	1.5
MAIA	N/A	N/A
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-10-20	2023-10-20
psSAR1g [W/kg]	0.508	0.584
psSAR10g [W/kg]	0.304	0.340
Power Drift [dB]	-0.03	0.08
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		83.3
Dist 3dB Peak [mm]		11.1
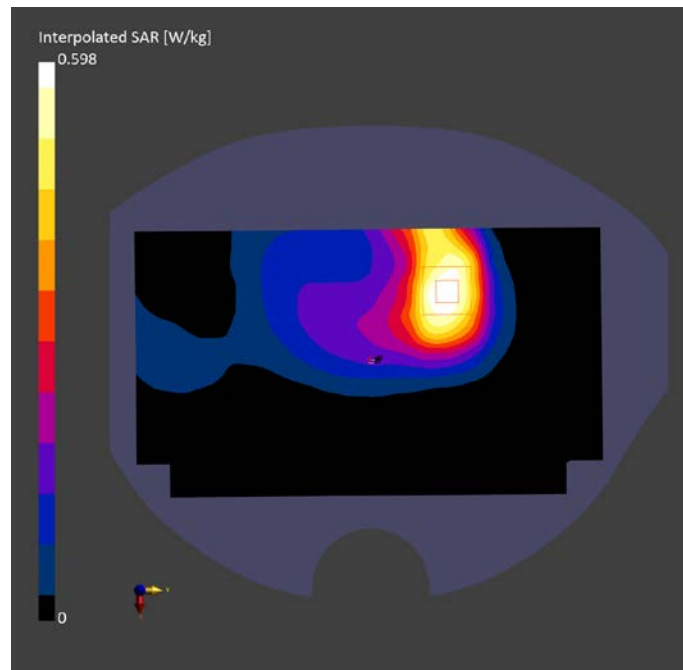
WCDMA 1700 Head

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Duty Cycle	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
RightHead, HSL	CHEEK, 0.00	Band 4	1:1	1752.600, 1513	8.65	1.351	40.261

Hardware Setup

Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Twin-SAM V8.0 (30deg probe tilt) - 2114	HBBL-600-10000	EX3DV4 - SN7727, 2023-06-05	DAE4 Sn1807, 2023-05-15

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	120.0 x 210.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	15.0 x 15.0	6.0 x 6.0 x 1.5
Sensor Surface [mm]	3.0	1.4
Graded Grid	N/A	Yes
Grading Ratio	N/A	1.5
MAIA	Y	Y
Surface Detection	All points	All points
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-10-20	2023-10-20
psSAR1g [W/kg]	0.192	0.196
psSAR10g [W/kg]	0.113	0.125
Power Drift [dB]	-0.04	0.07
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		86.3
Dist 3dB Peak [mm]		12.8
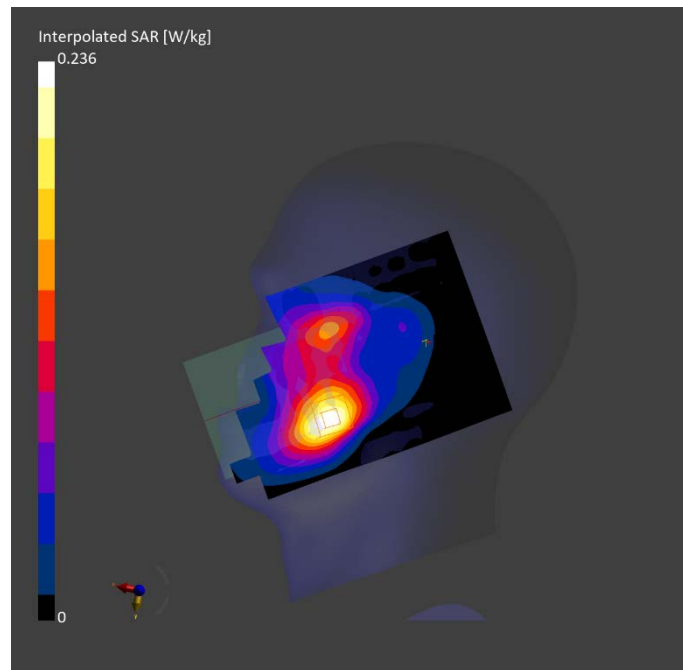
WCDMA 1700 Body

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Duty Cycle	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	EDGE BOTTOM, 18.00	Band 4	1:1	1732.400, 1412	8.65	1.341	40.292

Hardware Setup

Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Twin-SAM V8.0 (30deg probe tilt) - 2114	HBBL-600-10000	EX3DV4 - SN7727, 2023-06-05	DAE4 Sn1807, 2023-05-15

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	48.0 x 120.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	8.0 x 15.0	6.0 x 6.0 x 1.5
Sensor Surface [mm]	3.0	1.4
Graded Grid	N/A	Yes
Grading Ratio	N/A	1.5
MAIA	N/A	N/A
Surface Detection	All points	All points
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-10-20	2023-10-20
psSAR1g [W/kg]	0.809	0.839
psSAR10g [W/kg]	0.481	0.506
Power Drift [dB]	-0.18	-0.02
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		83.3
Dist 3dB Peak [mm]		17.4
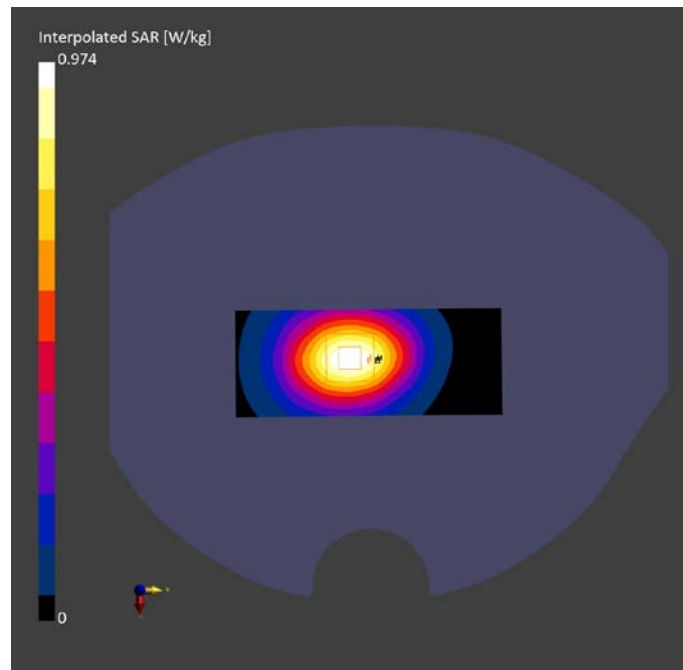
WCDMA 850 Head

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Duty Cycle	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
LeftHead, HSL	CHEEK, 0.00	Band 5	1:1	836.600, 4183	10.31	0.945	41.78

Hardware Setup

Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Twin-SAM V8.0 (30deg probe tilt) - 2114	HBBL-600-10000	EX3DV4 - SN7727, 2023-06-05	DAE4 Sn1807, 2023-05-15

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	120.0 x 210.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	15.0 x 15.0	6.0 x 6.0 x 1.5
Sensor Surface [mm]	3.0	1.4
Graded Grid	N/A	Yes
Grading Ratio	N/A	1.5
MAIA	N/A	N/A
Surface Detection	All points	All points
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-10-17	2023-10-17
psSAR1g [W/kg]	0.246	0.263
psSAR10g [W/kg]	0.168	0.199
Power Drift [dB]	-0.04	0.09
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		87.6
Dist 3dB Peak [mm]		> 15.0
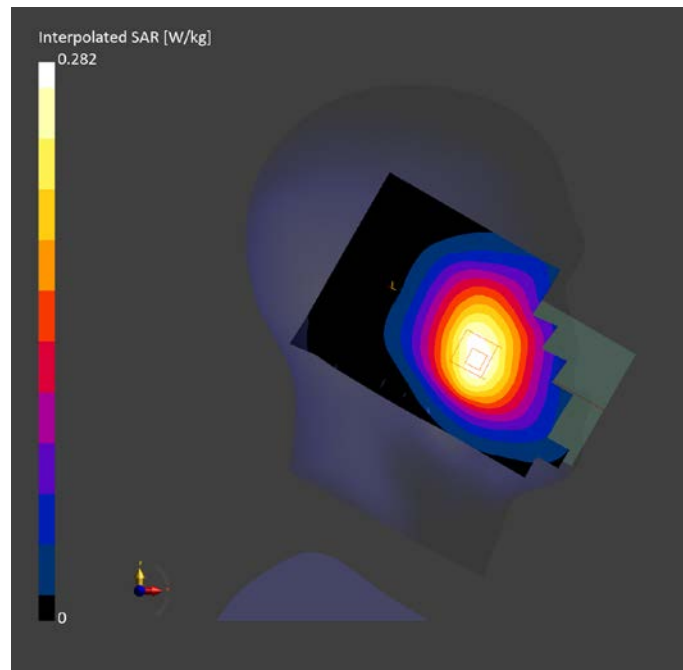
WCDMA 850 Body

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Duty Cycle	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	BACK, 10.00	Band 5	1:1	836.600, 4183	10.31	0.945	41.78

Hardware Setup

Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Twin-SAM V8.0 (30deg probe tilt) - 2114	HBBL-600-10000	EX3DV4 - SN7727, 2023-06-05	DAE4 Sn1807, 2023-05-15

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	120.0 x 210.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	15.0 x 15.0	6.0 x 6.0 x 1.5
Sensor Surface [mm]	3.0	1.4
Graded Grid	N/A	Yes
Grading Ratio	N/A	1.5
MAIA	N/A	N/A
Surface Detection	All points	All points
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-10-17	2023-17
psSAR1g [W/kg]	0.427	0.467
psSAR10g [W/kg]	0.276	0.273
Power Drift [dB]	-0.02	-0.02
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		79.1
Dist 3dB Peak [mm]		13.0
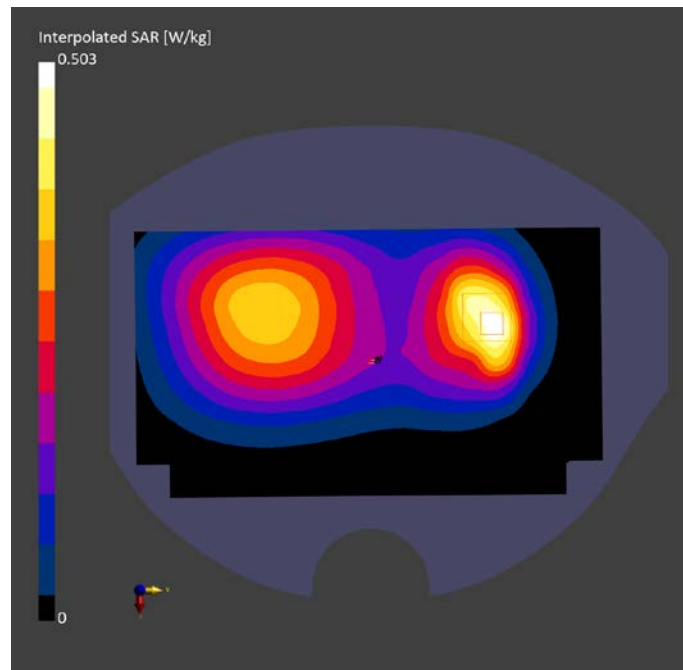
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LTE B2 Head

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Duty Cycle	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
LeftHead, HSL	CHEEK, 0.00	Band 2	1:1	1900.000, 19100	8.47	1.432	39.745

Hardware Setup

Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Twin-SAM V8.0 (30deg probe tilt) - 2114	HBBL-600-10000	EX3DV4 - SN7727, 2023-06-05	DAE4 Sn1807, 2023-05-15

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	120.0 x 210.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	15.0 x 15.0	6.0 x 6.0 x 1.5
Sensor Surface [mm]	3.0	1.4
Graded Grid	N/A	Yes
Grading Ratio	N/A	1.5
MAIA	Y	Y
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-10-23	2023-10-23
psSAR1g [W/kg]	0.132	0.133
psSAR10g [W/kg]	0.077	0.084
Power Drift [dB]	0.03	-0.05
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		86.7
Dist 3dB Peak [mm]		14.8
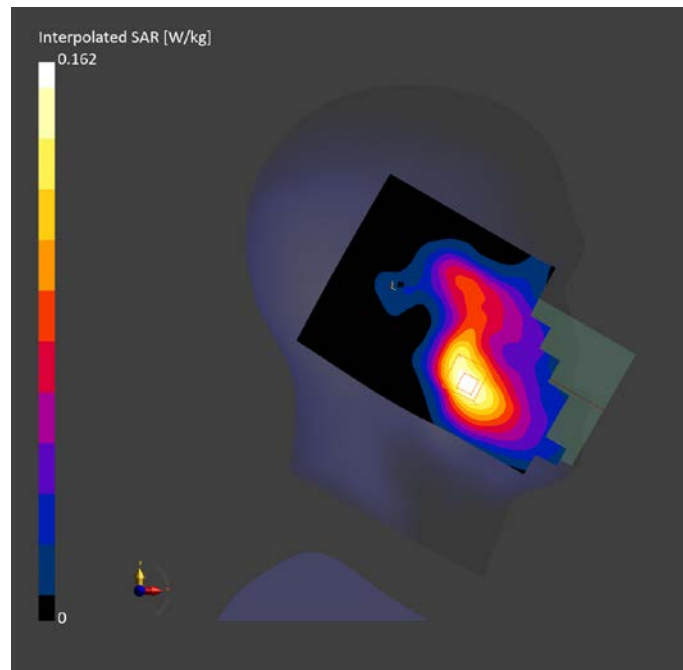
LTE B2 Body

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Duty Cycle	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	BACK, 10.00	Band 2	1:1	1900.000, 19100	8.47	1.432	39.745

Hardware Setup

Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Twin-SAM V8.0 (30deg probe tilt) - 2114	HBBL-600-10000	EX3DV4 - SN7727, 2023-06-05	DAE4 Sn1807, 2023-05-15

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	120.0 x 210.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	15.0 x 15.0	6.0 x 6.0 x 1.5
Sensor Surface [mm]	3.0	1.4
Graded Grid	N/A	Yes
Grading Ratio	N/A	1.5
MAIA	N/A	N/A
Surface Detection	VMS + 6p	All points
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-10-23	2023-10-23
psSAR1g [W/kg]	0.505	0.564
psSAR10g [W/kg]	0.300	0.328
Power Drift [dB]	0.01	-0.12
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		82.9
Dist 3dB Peak [mm]		19.0

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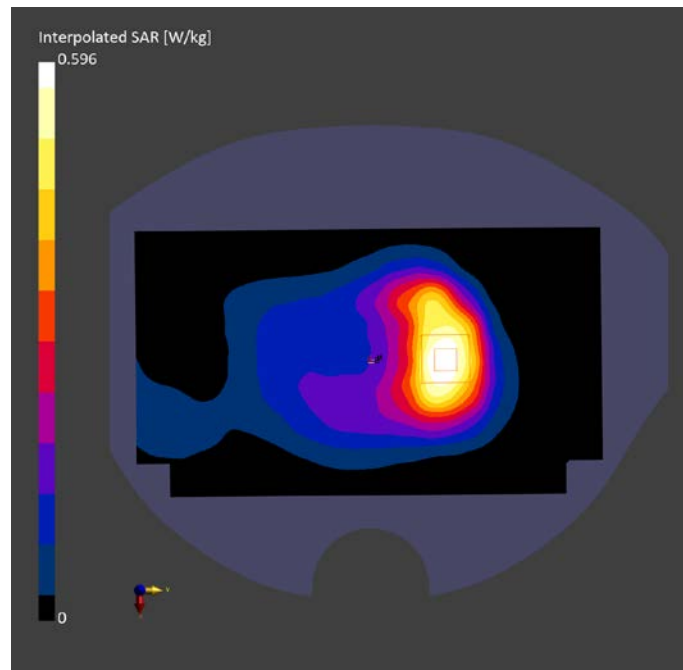
LTE B5 Head

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Duty Cycle	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
RightHead, HSL	CHEEK, 0.00	Band 5	1:1	836.500, 20525	10.31	0.903	42.918

Hardware Setup

Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Twin-SAM V8.0 (30deg probe tilt) - 2114	HBBL-600-10000	EX3DV4 - SN7727, 2023-06-05	DAE4 Sn1807, 2023-05-15

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	120.0 x 210.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	15.0 x 15.0	6.0 x 6.0 x 1.5
Sensor Surface [mm]	3.0	1.4
Graded Grid	N/A	Yes
Grading Ratio	N/A	1.5
MAIA	N/A	N/A
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-11-21	2023-11-21
psSAR1g [W/kg]	0.267	0.284
psSAR10g [W/kg]	0.185	0.219
Power Drift [dB]	-0.11	-0.18
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		91.9
Dist 3dB Peak [mm]		27.5
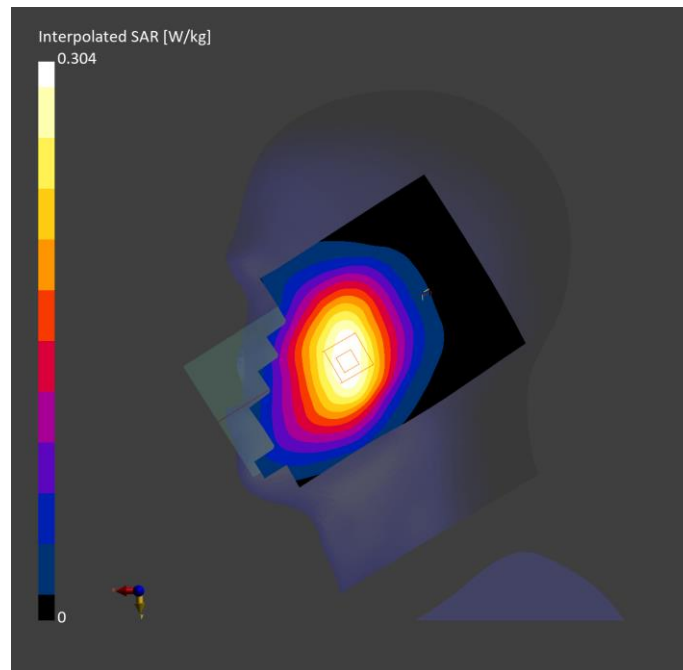
LTE B5 Body

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Duty Cycle	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	BACK, 10.00	Band 5	LTE-FDD, 10175-CAH	836.500, 20525	10.31	0.903	42.918

Hardware Setup

Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Twin-SAM V8.0 (30deg probe tilt) - 2114	HBBL-600-10000	EX3DV4 - SN7727, 2023-06-05	DAE4 Sn1807, 2023-05-15

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	120.0 x 210.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	15.0 x 15.0	6.0 x 6.0 x 1.5
Sensor Surface [mm]	3.0	1.4
Graded Grid	N/A	Yes
Grading Ratio	N/A	1.5
MAIA	N/A	N/A
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-11-21	2023-11-21
psSAR1g [W/kg]	0.466	0.492
psSAR10g [W/kg]	0.304	0.291
Power Drift [dB]	0.00	-0.05
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		79.6
Dist 3dB Peak [mm]		13.0

.
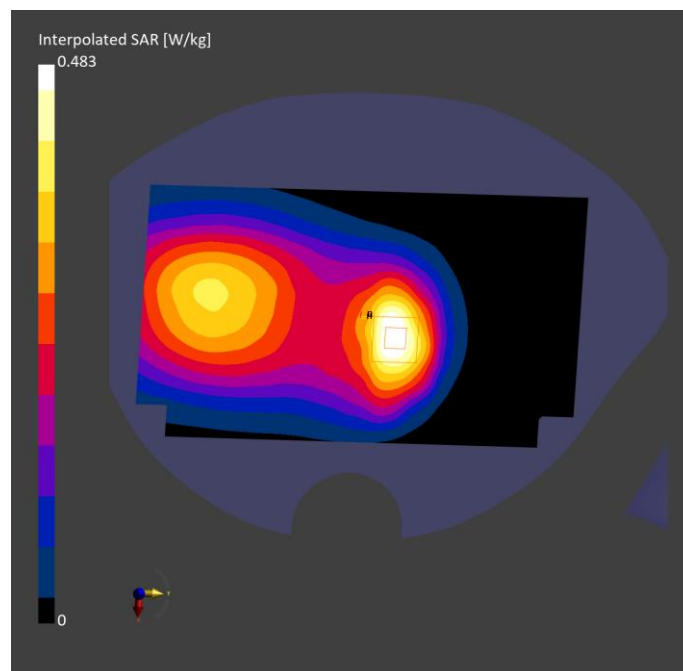
LTE B7 Head

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Duty Cycle	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
LeftHead, HSL	CHEEK, 0.00	Band 7	1:1	2535.000, 21100	8.08	1.852	39.569

Hardware Setup

Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Twin-SAM V8.0 (30deg probe tilt) - 2114	HBBL-600-10000	EX3DV4 - SN7727, 2023-06-05	DAE4 Sn1807, 2023-05-15

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	120.0 x 200.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	10.0 x 10.0	5.0 x 5.0 x 1.5
Sensor Surface [mm]	3.0	1.4
Graded Grid	N/A	Yes
Grading Ratio	N/A	1.5
MAIA	N/A	N/A
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-11-03	2023-11-03
psSAR1g [W/kg]	0.407	0.417
psSAR10g [W/kg]	0.206	0.219
Power Drift [dB]	-0.15	-0.06
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		84.6
Dist 3dB Peak [mm]		11.4
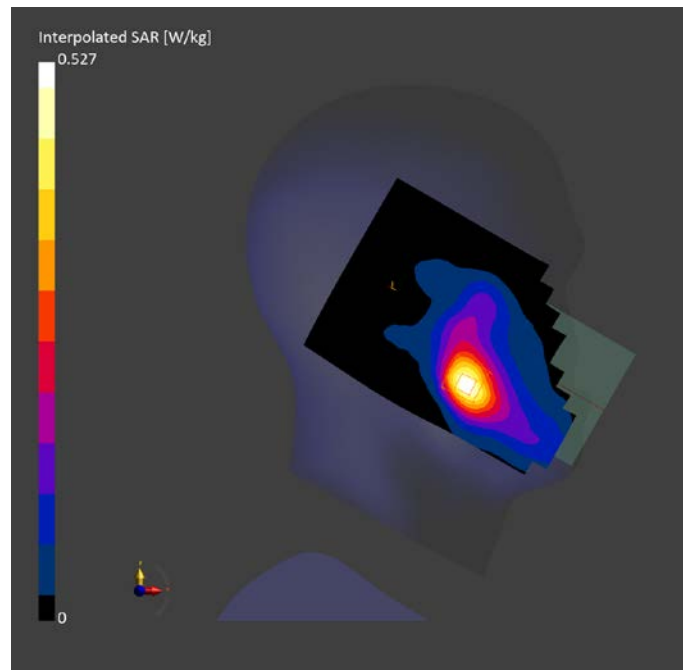
LTE B7 Body

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Duty Cycle	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	EDGE BOTTOM, 10.00	Band 7	1:1	2510.000, 20850	8.08	1.826	39.619

Hardware Setup

Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Twin-SAM V8.0 (30deg probe tilt) - 2114	HBBL-600-10000	EX3DV4 - SN7727, 2023-06-05	DAE4 Sn1807, 2023-05-15

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	48.0 x 120.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	8.0 x 10.0	5.0 x 5.0 x 1.5
Sensor Surface [mm]	3.0	1.4
Graded Grid	N/A	Yes
Grading Ratio	N/A	1.5
MAIA	N/A	N/A
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-11-03	2023-11-03
psSAR1g [W/kg]	0.732	0.743
psSAR10g [W/kg]	0.348	0.352
Power Drift [dB]	-0.01	-0.10
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		81.6
Dist 3dB Peak [mm]		15.3
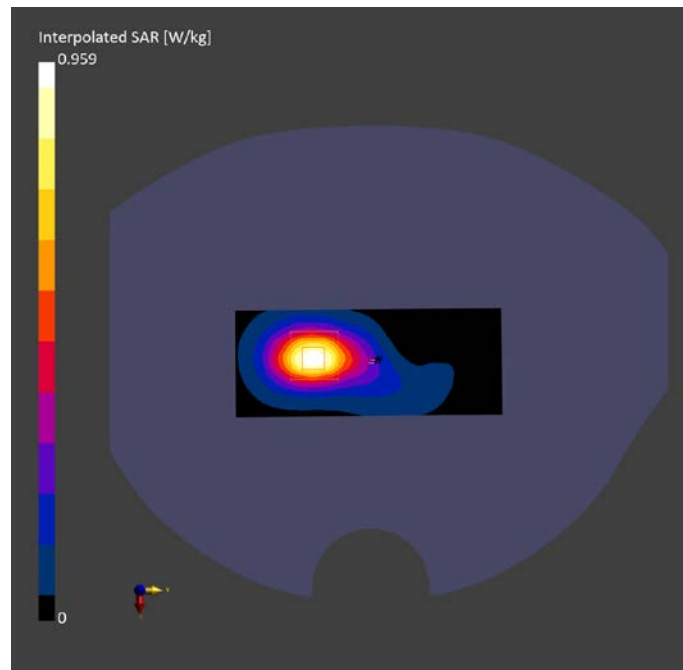
LTE B12 Head

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Duty Cycle	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
RightHead, HSL	CHEEK, 0.00	Band 12	1:1	707.500, 23095	10.31	0.876	41.718

Hardware Setup

Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Twin-SAM V8.0 (30deg probe tilt) - 2114	HBBL-600-10000	EX3DV4 - SN7727, 2023-06-05	DAE4 Sn1807, 2023-05-15

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	120.0 x 210.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	15.0 x 15.0	6.0 x 6.0 x 1.5
Sensor Surface [mm]	3.0	1.4
Graded Grid	N/A	Yes
Grading Ratio	N/A	1.5
MAIA	Y	N/A
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-10-25	2023-10-25
psSAR1g [W/kg]	0.148	0.160
psSAR10g [W/kg]	0.103	0.122
Power Drift [dB]	-0.17	-0.14
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		92.4
Dist 3dB Peak [mm]		27.3
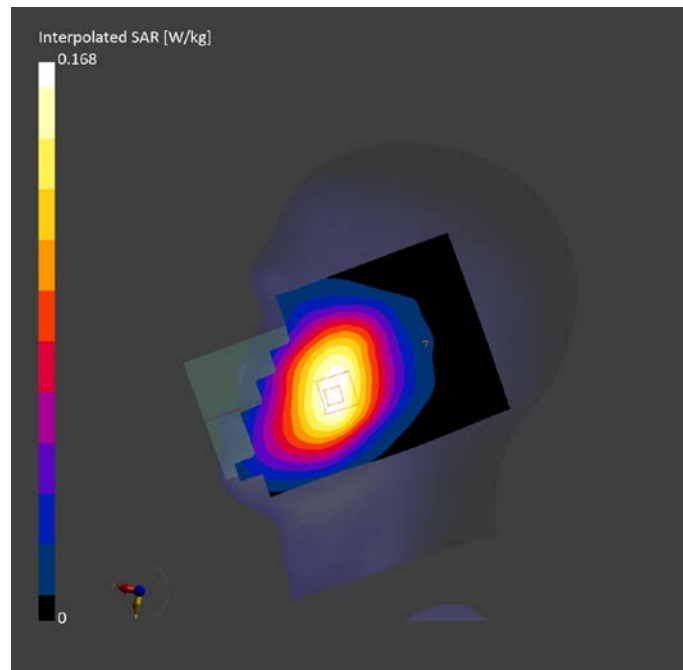
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LTE B12 Body

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Duty Cycle	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	BACK, 10.00	Band 12	1:1	707.500, 23095	10.31	0.876	41.718

Hardware Setup

Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Twin-SAM V8.0 (30deg probe tilt) - 2114	HBBL-600-10000	EX3DV4 - SN7727, 2023-06-05	DAE4 Sn1807, 2023-05-15

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	120.0 x 210.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	15.0 x 15.0	6.0 x 6.0 x 1.5
Sensor Surface [mm]	3.0	1.4
Graded Grid	N/A	Yes
Grading Ratio	N/A	1.5
MAIA	N/A	N/A
Surface Detection	VMS + 6p	All points
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-10-25	2023-10-25
psSAR1g [W/kg]	0.290	0.302
psSAR10g [W/kg]	0.209	0.230
Power Drift [dB]	-0.05	-0.02
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		86.2
Dist 3dB Peak [mm]		> 15.0

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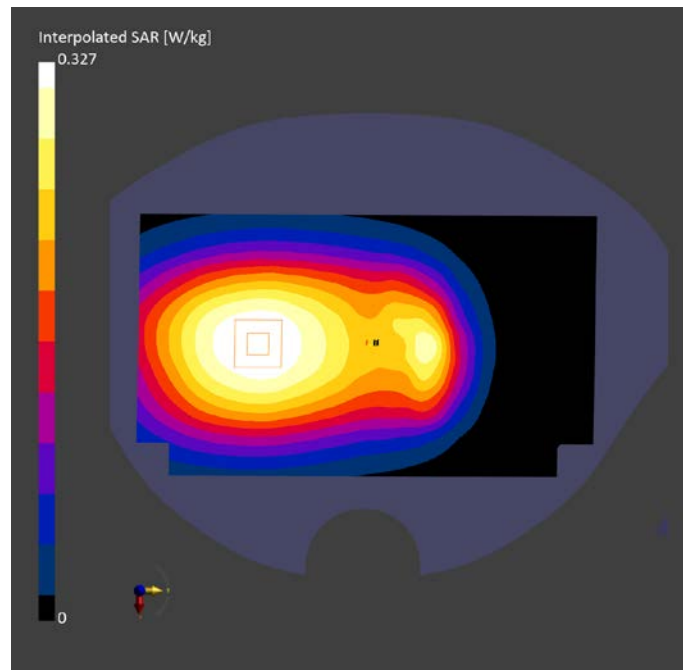
LTE B13 Head

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Duty Cycle	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
RightHead, HSL	CHEEK, 0.00	Band 13	1:1	782.000, 23230	10.31	0.906	41.509

Hardware Setup

Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Twin-SAM V8.0 (30deg probe tilt) - 2114	HBBL-600-10000	EX3DV4 - SN7727, 2023-06-05	DAE4 Sn1807, 2023-05-15

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	120.0 x 210.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	15.0 x 15.0	6.0 x 6.0 x 1.5
Sensor Surface [mm]	3.0	1.4
Graded Grid	N/A	Yes
Grading Ratio	N/A	1.5
MAIA	N/A	N/A
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-10-25	2023-10-25
psSAR1g [W/kg]	0.189	0.199
psSAR10g [W/kg]	0.131	0.152
Power Drift [dB]	-0.12	-0.14
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		91.4
Dist 3dB Peak [mm]		26.7

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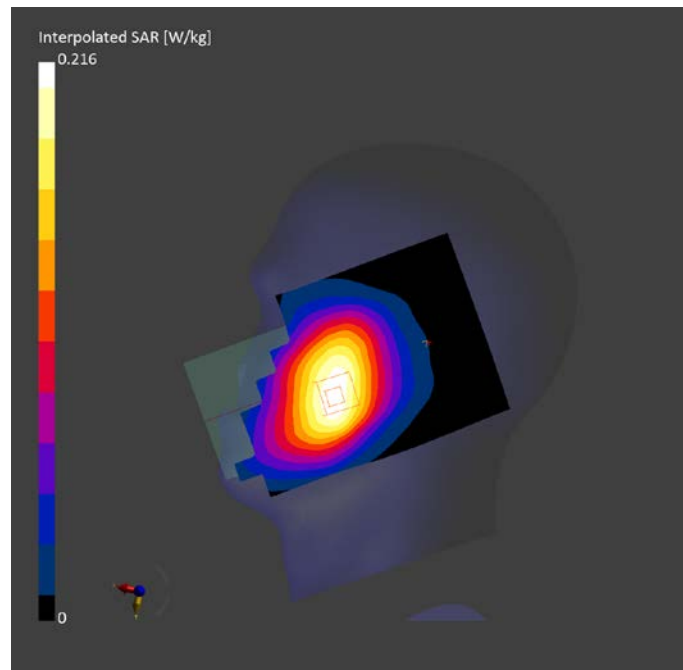
LTE B13 Body

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Duty Cycle	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	BACK, 10.00	Band 13	1:1	782.000, 23230	10.31	0.906	41.509

Hardware Setup

Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Twin-SAM V8.0 (30deg probe tilt) - 2114	HBBL-600-10000	EX3DV4 - SN7727, 2023-06-05	DAE4 Sn1807, 2023-05-15

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	120.0 x 210.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	15.0 x 15.0	6.0 x 6.0 x 1.5
Sensor Surface [mm]	3.0	1.4
Graded Grid	N/A	Yes
Grading Ratio	N/A	1.5
MAIA	N/A	N/A
Surface Detection	VMS + 6p	All points
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-10-25	2023-10-25
psSAR1g [W/kg]	0.313	0.315
psSAR10g [W/kg]	0.198	0.183
Power Drift [dB]	-0.04	-0.01
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		77.1
Dist 3dB Peak [mm]		13.0
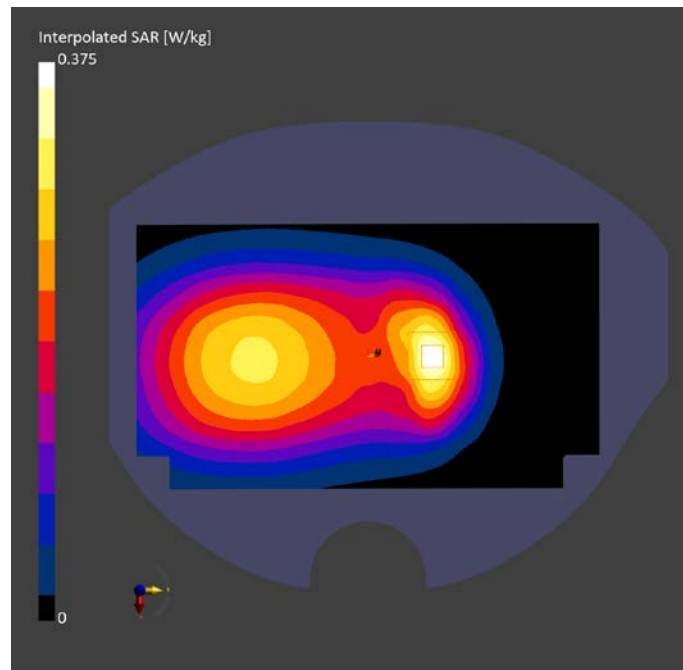
LTE B26 Head

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Duty Cycle	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
LeftHead, HSL	CHEEK, 0.00	Band 26	1:1	831.500, 26865	10.31	0.942	41.778

Hardware Setup

Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Twin-SAM V8.0 (30deg probe tilt) - 2114	HBBL-600-10000	EX3DV4 - SN7727, 2023-06-05	DAE4 Sn1807, 2023-05-15

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	120.0 x 210.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	15.0 x 15.0	6.0 x 6.0 x 1.5
Sensor Surface [mm]	3.0	1.4
Graded Grid	N/A	Yes
Grading Ratio	N/A	1.5
MAIA	N/A	N/A
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-10-17	2023-10-17
psSAR1g [W/kg]	0.215	0.243
psSAR10g [W/kg]	0.149	0.184
Power Drift [dB]	0.03	-0.15
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		89.5
Dist 3dB Peak [mm]		> 15.0

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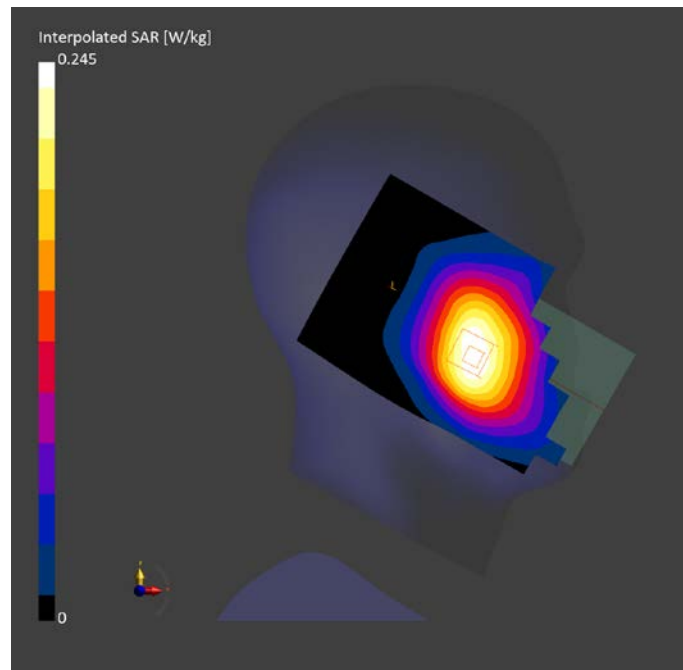
LTE B26 Body

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Duty Cycle	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	BACK, 10.00	Band 26	1:1	831.500, 26865	10.31	0.942	41.778

Hardware Setup

Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Twin-SAM V8.0 (30deg probe tilt) - 2114	HBBL-600-10000	EX3DV4 - SN7727, 2023-06-05	DAE4 Sn1807, 2023-05-15

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	120.0 x 210.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	15.0 x 15.0	6.0 x 6.0 x 1.5
Sensor Surface [mm]	3.0	1.4
Graded Grid	N/A	Yes
Grading Ratio	N/A	1.5
MAIA	N/A	N/A
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-10-17	2023-10-17
psSAR1g [W/kg]	0.425	0.435
psSAR10g [W/kg]	0.280	0.255
Power Drift [dB]	-0.03	-0.01
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		80.3
Dist 3dB Peak [mm]		12.0

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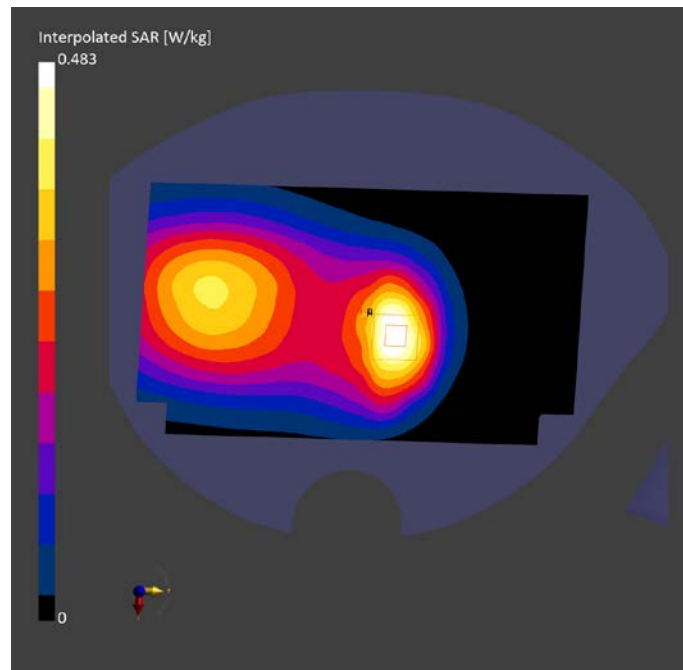
LTE B28 Head

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Duty Cycle	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
RightHead, HSL	CHEEK, 0.00	Band 28	1:1	728.000, 27460	10.31	0.888	41.614

Hardware Setup

Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Twin-SAM V8.0 (30deg probe tilt) - 2114	HBBL-600-10000	EX3DV4 - SN7727, 2023-06-05	DAE4 Sn1807, 2023-05-15

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	120.0 x 210.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	15.0 x 15.0	6.0 x 6.0 x 1.5
Sensor Surface [mm]	3.0	1.4
Graded Grid	N/A	Yes
Grading Ratio	N/A	1.5
MAIA	N/A	N/A
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-10-25	2023-10-25
psSAR1g [W/kg]	0.184	0.204
psSAR10g [W/kg]	0.128	0.158
Power Drift [dB]	0.07	0.09
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		90.9
Dist 3dB Peak [mm]		> 15.0
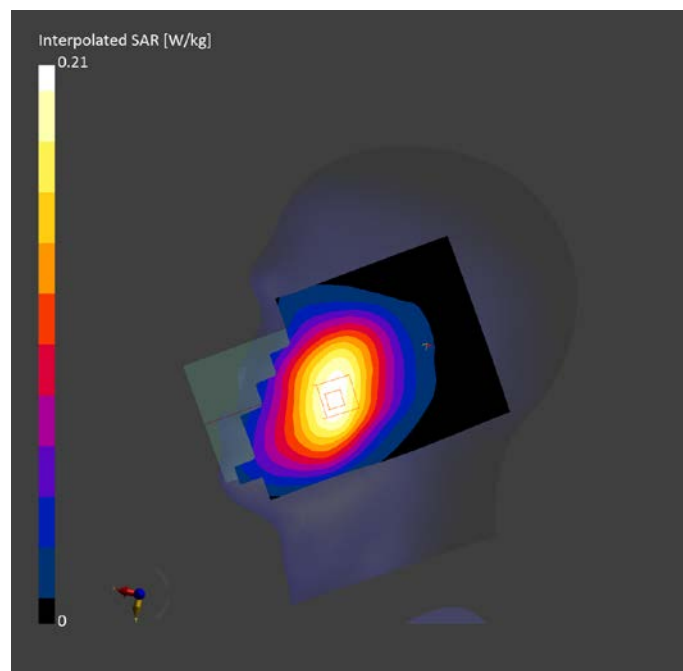
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LTE B28 Body

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Duty Cycle	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	BACK, 10.00	Band 28	1:1	728.000, 27460	10.31	0.888	41.614

Hardware Setup

Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Twin-SAM V8.0 (30deg probe tilt) - 2114	HBBL-600-10000	EX3DV4 - SN7727, 2023-06-05	DAE4 Sn1807, 2023-05-15

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	120.0 x 210.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	15.0 x 15.0	6.0 x 6.0 x 1.5
Sensor Surface [mm]	3.0	1.4
Graded Grid	N/A	Yes
Grading Ratio	N/A	1.5
MAIA	N/A	N/A
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-10-25	2023-10-25
psSAR1g [W/kg]	0.327	0.341
psSAR10g [W/kg]	0.235	0.261
Power Drift [dB]	0.17	0.06
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		88.3
Dist 3dB Peak [mm]		> 15.0
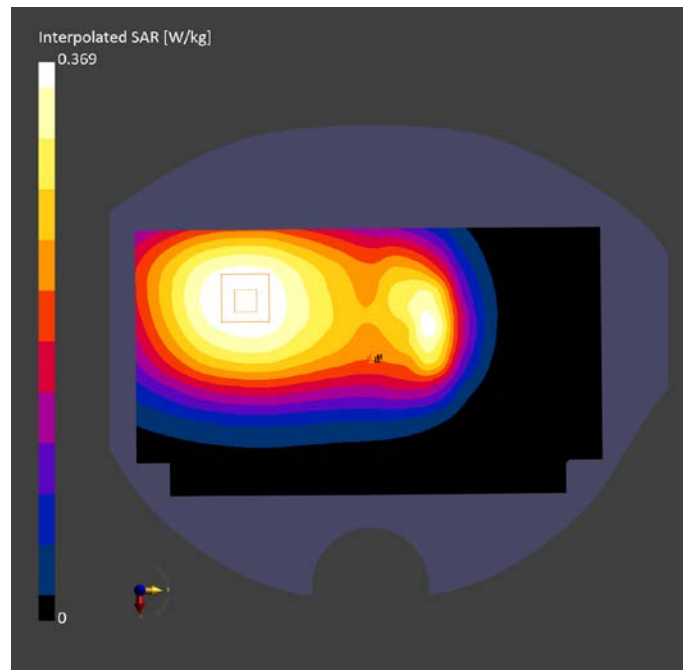
LTE B41 Head

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Duty Cycle	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
LeftHead, HSL	CHEEK, 0.00	Band 41	1:1.58	2593.000, 40620	7.9	1.925	38.903

Hardware Setup

Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Twin-SAM V8.0 (30deg probe tilt) - 2114	HBBL-600-10000	EX3DV4 - SN7727, 2023-06-05	DAE4 Sn1807, 2023-05-15

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	120.0 x 200.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	10.0 x 10.0	5.0 x 5.0 x 1.5
Sensor Surface [mm]	3.0	1.4
Graded Grid	N/A	Yes
Grading Ratio	N/A	1.5
MAIA	Y	N/A
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-11-06	2023-11-06
psSAR1g [W/kg]	0.251	0.255
psSAR10g [W/kg]	0.128	0.130
Power Drift [dB]	-0.05	-0.02
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		80.4
Dist 3dB Peak [mm]		8.4
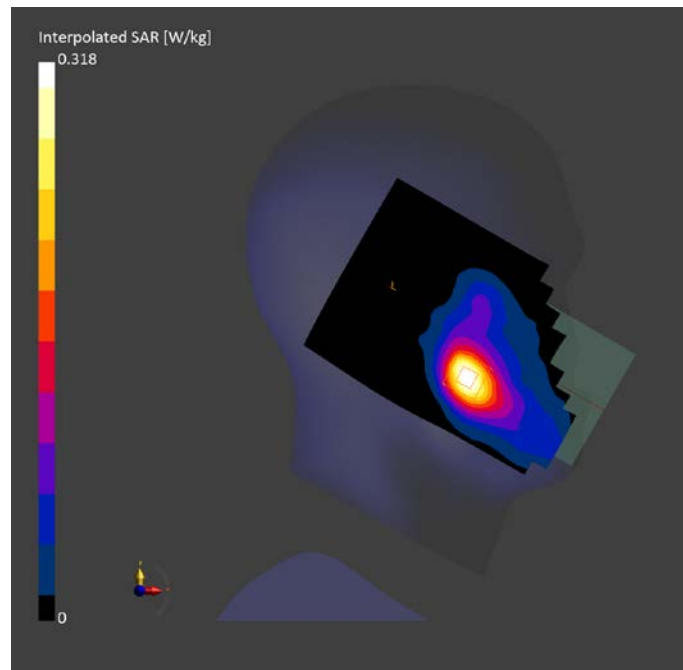
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LTE B41 Body

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Duty Cycle	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	EDGE BOTTOM, 10.00	Band 41	1:1.58	2506.000, 39750	8.08	1.821	39.633

Hardware Setup

Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Twin-SAM V8.0 (30deg probe tilt) - 2114	HBBL-600-10000	EX3DV4 - SN7727, 2023-06-05	DAE4 Sn1807, 2023-05-15

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	48.0 x 120.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	8.0 x 10.0	5.0 x 5.0 x 1.5
Sensor Surface [mm]	3.0	1.4
Graded Grid	N/A	Yes
Grading Ratio	N/A	1.5
MAIA	N/A	N/A
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-11-03	2023-11-03
psSAR1g [W/kg]	0.946	0.966
psSAR10g [W/kg]	0.450	0.457
Power Drift [dB]	0.20	-0.04
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		81.5
Dist 3dB Peak [mm]		10.0
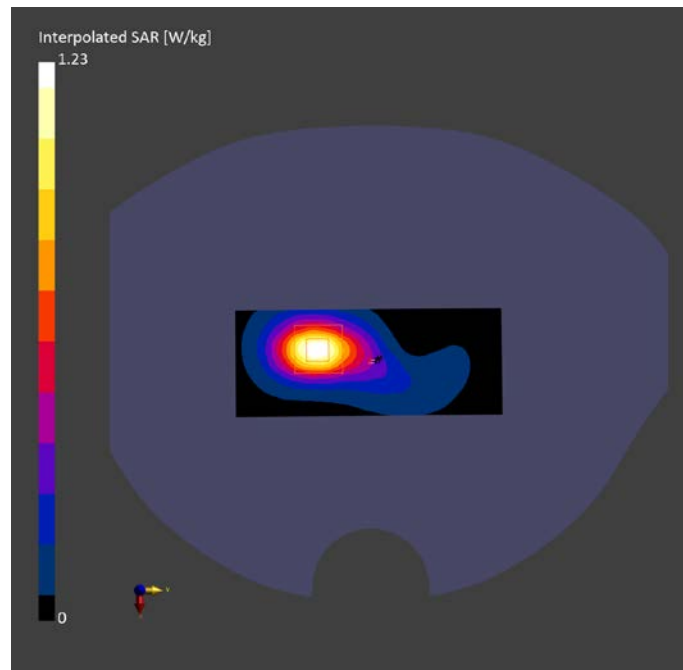
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LTE B66 Head

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Duty Cycle	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
RightHead, HSL	CHEEK, 0.00	Band 66	1:1	1745.000, 132322	8.65	1.349	40.27

Hardware Setup

Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Twin-SAM V8.0 (30deg probe tilt) - 2114	HBBL-600-10000	EX3DV4 - SN7727, 2023-06-05	DAE4 Sn1807, 2023-05-15

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	120.0 x 210.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	15.0 x 15.0	6.0 x 6.0 x 1.5
Sensor Surface [mm]	3.0	1.4
Graded Grid	N/A	Yes
Grading Ratio	N/A	1.5
MAIA	Y	Y
Surface Detection	Unknown method	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-10-20	2023-10-20
psSAR1g [W/kg]	0.143	0.145
psSAR10g [W/kg]	0.084	0.090
Power Drift [dB]	-0.03	-0.07
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		90.4
Dist 3dB Peak [mm]		13.2

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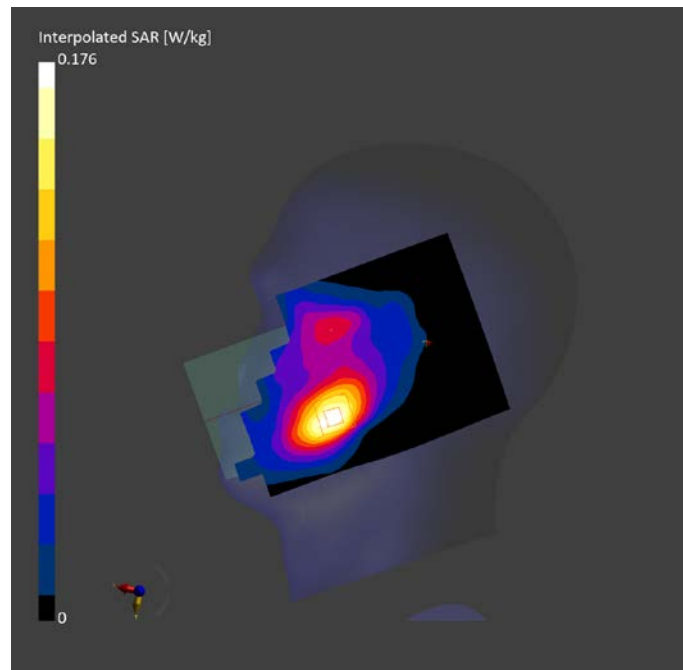
LTE B66 Body

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Duty Cycle	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	BACK, 10.00	Band 66	1:1	1745.000, 132322	8.65	1.349	40.27

Hardware Setup

Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Twin-SAM V8.0 (30deg probe tilt) - 2114	HBBL-600-10000	EX3DV4 - SN7727, 2023-06-05	DAE4 Sn1807, 2023-05-15

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	120.0 x 210.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	15.0 x 15.0	6.0 x 6.0 x 1.5
Sensor Surface [mm]	3.0	1.4
Graded Grid	N/A	Yes
Grading Ratio	N/A	1.5
MAIA	N/A	N/A
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-10-20	2023-10-20
psSAR1g [W/kg]	0.843	0.888
psSAR10g [W/kg]	0.496	0.523
Power Drift [dB]	-0.02	0.16
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		84.5
Dist 3dB Peak [mm]		12.1
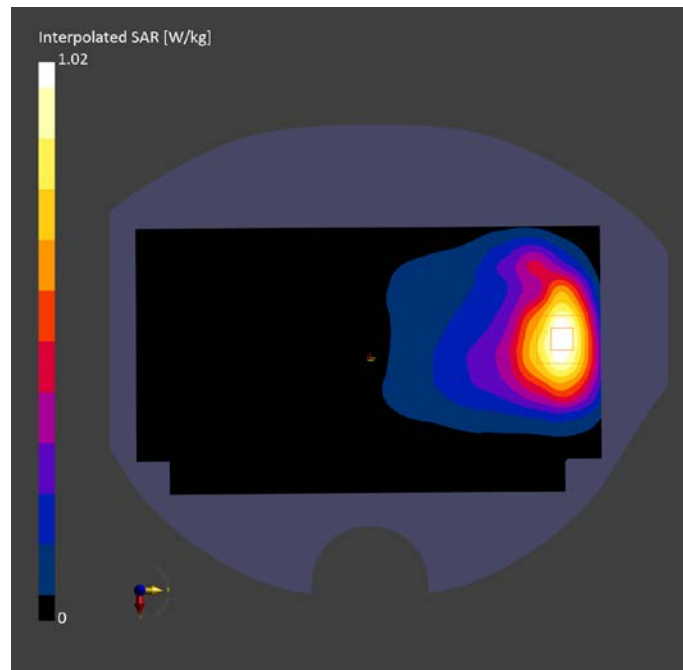
WLAN 2.4G Head

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Duty Cycle	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
LeftHead, HSL	CHEEK, 0.00	WLAN 2.4GHz	1:1	2437.000, 6	8.08	1.767	39.75

Hardware Setup

Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Twin-SAM V8.0 (30deg probe tilt) - 2114	HBBL-600-10000	EX3DV4 - SN7727, 2023-06-05	DAE4 Sn1807, 2023-05-15

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	120.0 x 200.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	10.0 x 10.0	5.0 x 5.0 x 1.5
Sensor Surface [mm]	3.0	1.4
Graded Grid	N/A	Yes
Grading Ratio	N/A	1.5
MAIA	N/A	N/A
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-11-03	2023-11-03
psSAR1g [W/kg]	0.537	0.538
psSAR10g [W/kg]	0.263	0.259
Power Drift [dB]	0.04	0.12
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		79.4
Dist 3dB Peak [mm]		7.7
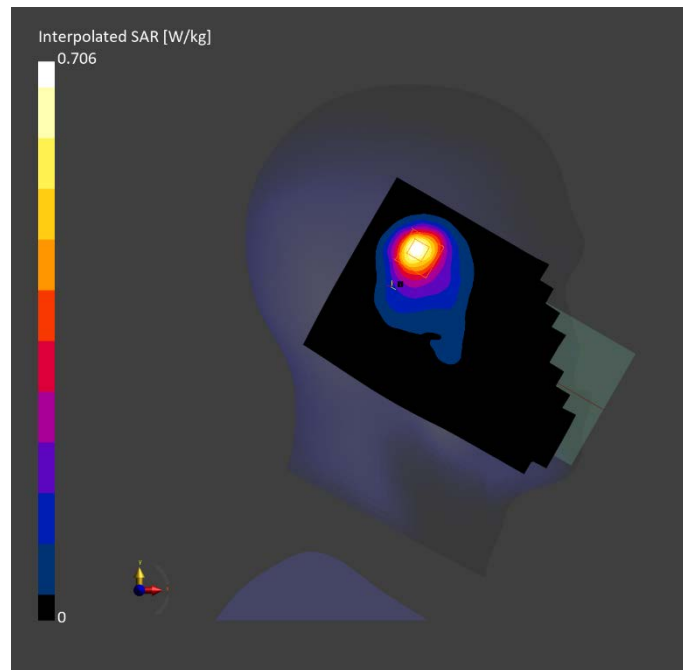
WLAN 2.4G Body

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Duty Cycle	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	BACK, 10.00	WLAN 2.4GHz	1:1	2437.000, 6	8.08	1.767	39.75

Hardware Setup

Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Twin-SAM V8.0 (30deg probe tilt) - 2114	HBBL-600-10000	EX3DV4 - SN7727, 2023-06-05	DAE4 Sn1807, 2023-05-15

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	120.0 x 200.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	10.0 x 10.0	5.0 x 5.0 x 1.5
Sensor Surface [mm]	3.0	1.4
Graded Grid	N/A	Yes
Grading Ratio	N/A	1.5
MAIA	Y	N/A
Surface Detection	VMS + 6p	All points
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-11-03	2023-11-03
psSAR1g [W/kg]	0.237	0.232
psSAR10g [W/kg]	0.119	0.112
Power Drift [dB]	0.15	0.02
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		80.8
Dist 3dB Peak [mm]		9.0
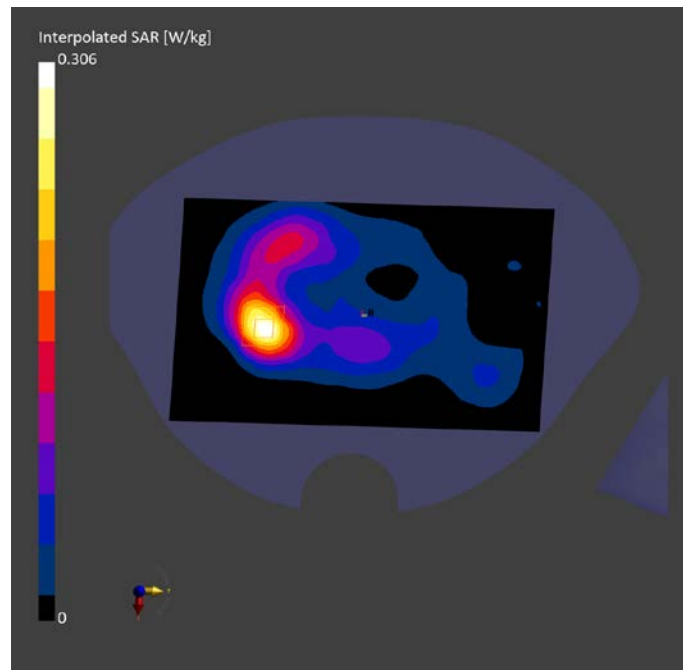
WLAN 5G Head

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Duty Cycle	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
LeftHead, HSL	CHEEK, 0.00	WLAN 5GHz	1:1	5610.000, 122	5.25	5.151	35.315

Hardware Setup

Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Twin-SAM V8.0 (30deg probe tilt) - 2114	HBBL-600-10000	EX3DV4 - SN7727, 2023-06-05	DAE4 Sn1807, 2023-05-15

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	120.0 x 200.0	22.0 x 22.0 x 22.0
Grid Steps [mm]	10.0 x 10.0	4.0 x 4.0 x 1.4
Sensor Surface [mm]	3.0	1.4
Graded Grid	N/A	Yes
Grading Ratio	N/A	1.4
MAIA	Y	Y
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-11-12	2023-11-12
psSAR1g [W/kg]	0.331	0.397
psSAR10g [W/kg]	0.088	0.096
Power Drift [dB]	0.02	0.13
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		63.2
Dist 3dB Peak [mm]		5.4
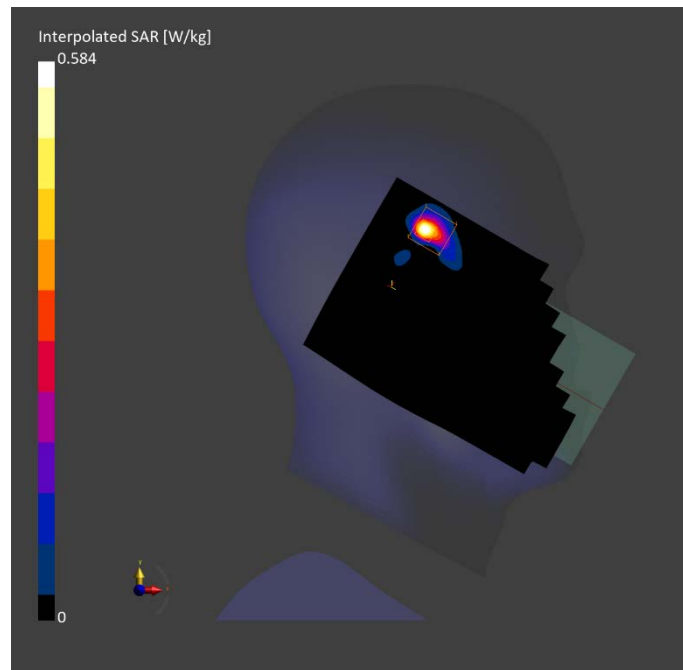
WLAN 5G Body

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Duty Cycle	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	BACK, 15.00	WLAN 5GHz	1:1	5600.000, 120	5.25	5.143	35.34

Hardware Setup

Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Twin-SAM V8.0 (30deg probe tilt) - 2114	HBBL-600-10000	EX3DV4 - SN7727, 2023-06-05	DAE4 Sn1807, 2023-05-15

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	120.0 x 200.0	22.0 x 22.0 x 22.0
Grid Steps [mm]	10.0 x 10.0	4.0 x 4.0 x 1.4
Sensor Surface [mm]	3.0	1.4
Graded Grid	N/A	Yes
Grading Ratio	N/A	1.4
MAIA	Y	Y
Surface Detection	VMS + 6p	All points
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-11-12	2023-11-12
psSAR1g [W/kg]	0.419	0.442
psSAR10g [W/kg]	0.165	0.165
Power Drift [dB]	0.02	0.01
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		59.0
Dist 3dB Peak [mm]		10.4
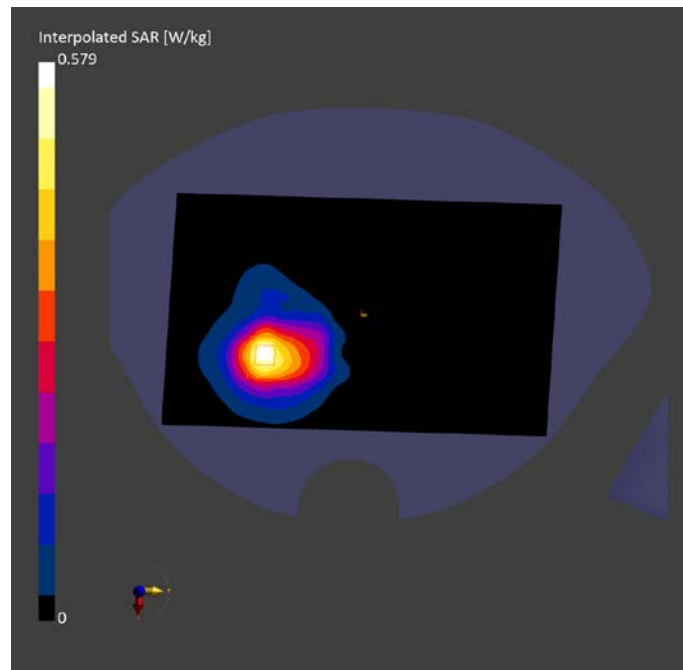
BT Head

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Duty Cycle	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
LeftHead, HSL	CHEEK, 0.00	ISM 2.4 GHz Band	1:1	2480.000, 78	8.08	1.794	39.672

Hardware Setup

Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Twin-SAM V8.0 (30deg probe tilt) - 2114	HBBL-600-10000	EX3DV4 - SN7727, 2023-06-05	DAE4 Sn1807, 2023-05-15

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	120.0 x 200.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	10.0 x 10.0	5.0 x 5.0 x 1.5
Sensor Surface [mm]	3.0	1.4
Graded Grid	N/A	Yes
Grading Ratio	N/A	1.5
MAIA	Y	Y
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-11-03	2023-11-03
psSAR1g [W/kg]	0.069	0.068
psSAR10g [W/kg]	0.034	0.031
Power Drift [dB]	-0.03	0.06
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		79.1
Dist 3dB Peak [mm]		10.0
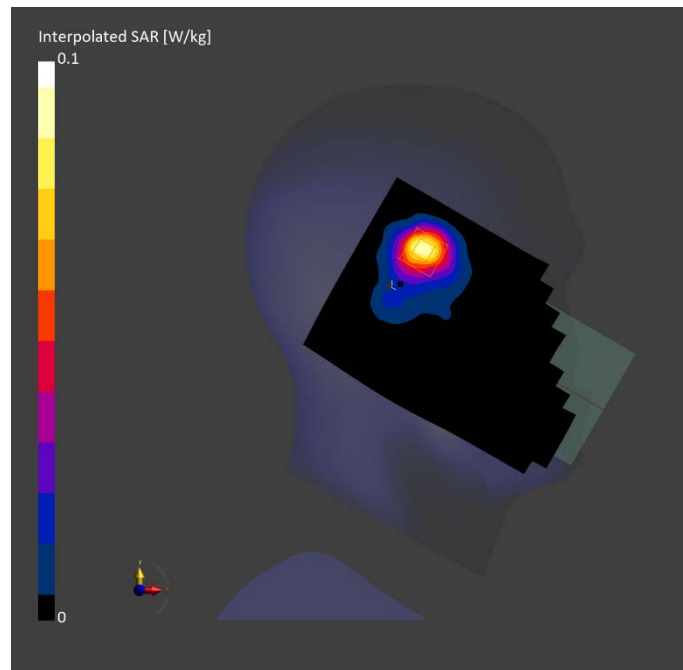
BT Body

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Duty Cycle	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	BACK, 10.00	ISM 2.4 GHz Band	1:1	2480.000, 78	8.08	1.794	39.672

Hardware Setup

Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Twin-SAM V8.0 (30deg probe tilt) - 2114	HBBL-600-10000	EX3DV4 - SN7727, 2023-06-05	DAE4 Sn1807, 2023-05-15

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	120.0 x 200.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	10.0 x 10.0	4.4 x 4.4 x 1.5
Sensor Surface [mm]	3.0	1.4
Graded Grid	N/A	Yes
Grading Ratio	N/A	1.5
MAIA	Y	Y
Surface Detection	VMS + 6p	All points
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-11-03	2023-11-03
psSAR1g [W/kg]	0.018	0.022
psSAR10g [W/kg]	0.008	0.001
Power Drift [dB]	0.01	-0.09
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		73.2
Dist 3dB Peak [mm]		6.0
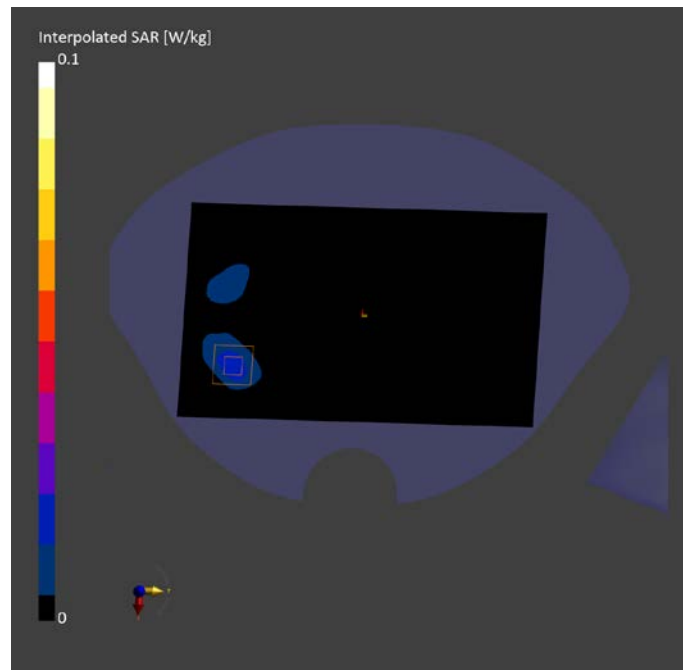
ANNEX B System Verification Results

750MHz

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	EDGE TOP, 5.00	D750	CW, 0--	750.000, 50	10.31	0.898	41.542

Hardware Setup

Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Twin-SAM V8.0 (30deg probe tilt) - 2114	HBBL-600-10000	EX3DV4 - SN7727, 2023-06-05	DAE4 Sn1807, 2023-05-15

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	48.0 x 90.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	8.0 x 15.0	6.0 x 6.0 x 1.5
Sensor Surface [mm]	3.0	1.4
Graded Grid	N/A	Yes
Grading Ratio	N/A	1.5
MAIA	N/A	N/A
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-10-25	2023-10-25
psSAR1g [W/kg]	1.95	2.15
psSAR10g [W/kg]	1.22	1.42
Power Drift [dB]	0.01	-0.05
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		83.1
Dist 3dB Peak [mm]		18.0
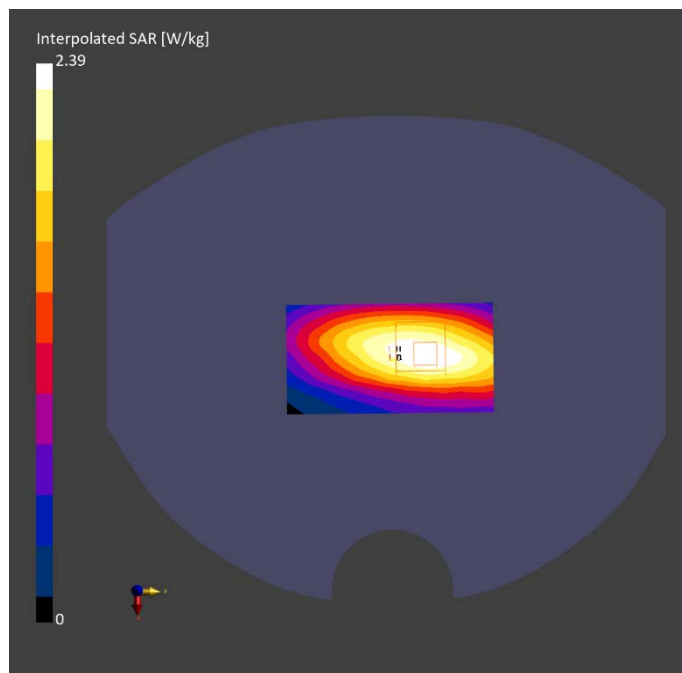
835MHz

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	BACK, 5.00	CD835	CW, 0--	835.000, 50	10.31	0.945	41.78

Hardware Setup

Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Twin-SAM V8.0 (30deg probe tilt) - 2114	HBBL-600-10000	EX3DV4 - SN7727, 2023-06-05	DAE4 Sn1807, 2023-05-15

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	120.0 x 150.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	15.0 x 15.0	6.0 x 6.0 x 1.5
Sensor Surface [mm]	3.0	1.4
Graded Grid	N/A	Yes
Grading Ratio	N/A	1.5
MAIA	N/A	N/A
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-10-17	2023-10-17
psSAR1g [W/kg]	2.33	2.38
psSAR10g [W/kg]	1.54	1.55
Power Drift [dB]	0.02	-0.02
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		84.1
Dist 3dB Peak [mm]		19.7
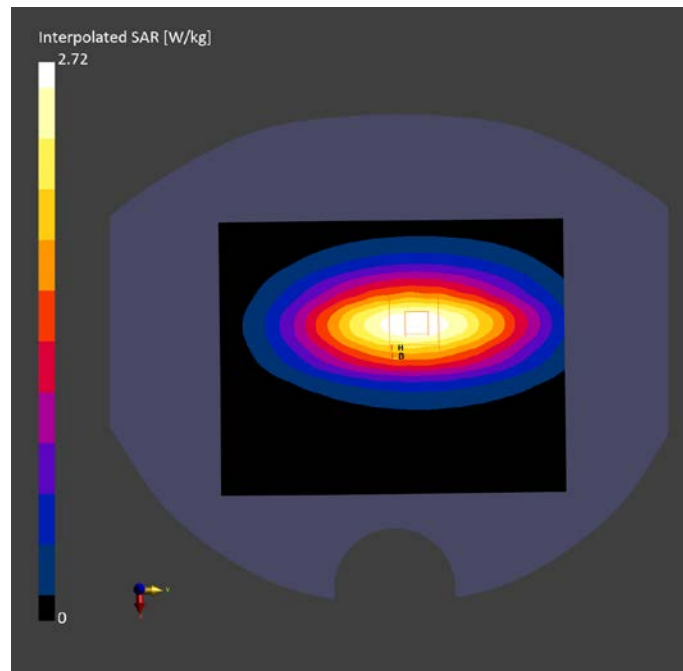
835MHz

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	BACK, 5.00	CD835	CW, 0--	835.000, 50	10.31	0.919	42.863

Hardware Setup

Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Twin-SAM V8.0 (30deg probe tilt) - 2114	HBBL-600-10000	EX3DV4 - SN7727, 2023-06-05	DAE4 Sn1807, 2023-05-15

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	120.0 x 150.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	15.0 x 15.0	6.0 x 6.0 x 1.5
Sensor Surface [mm]	3.0	1.4
Graded Grid	N/A	Yes
Grading Ratio	N/A	1.5
MAIA	N/A	N/A
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-10-21	2023-10-21
psSAR1g [W/kg]	2.44	2.48
psSAR10g [W/kg]	1.58	1.61
Power Drift [dB]	0.07	-0.11
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		84.1
Dist 3dB Peak [mm]		19.7
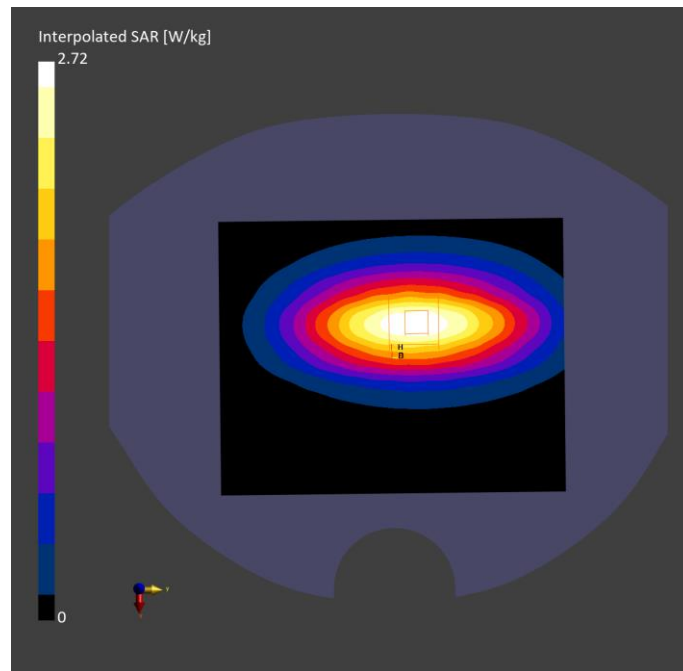
1800MHz

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	BACK, 5.00	D1800	CW, 0--	1800.000, 50	8.65	1.38	40.254

Hardware Setup

Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Twin-SAM V8.0 (30deg probe tilt) - 2114	HBBL-600-10000	EX3DV4 - SN7727, 2023-06-05	DAE4 Sn1807, 2023-05-15

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	120.0 x 150.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	15.0 x 15.0	6.0 x 6.0 x 1.5
Sensor Surface [mm]	3.0	1.4
Graded Grid	N/A	Yes
Grading Ratio	N/A	1.5
MAIA	N/A	N/A
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-10-20	2023-10-20
psSAR1g [W/kg]	9.37	9.51
psSAR10g [W/kg]	4.73	5.01
Power Drift [dB]	-0.06	0.10
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		80.8
Dist 3dB Peak [mm]		9.6

Interpolated SAR [W/kg]
10.8
0
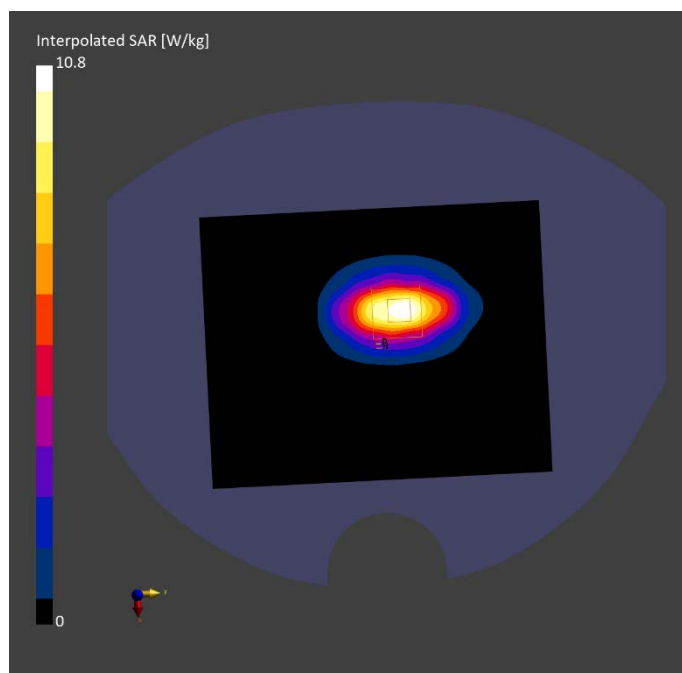
1900MHz

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	BACK, 5.00	D1900	CW, 0--	1900.000, 50	8.47	1.432	39.745

Hardware Setup

Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Twin-SAM V8.0 (30deg probe tilt) - 2114	HBBL-600-10000	EX3DV4 - SN7727, 2023-06-05	DAE4 Sn1807, 2023-05-15

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	120.0 x 150.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	15.0 x 15.0	6.0 x 6.0 x 1.5
Sensor Surface [mm]	3.0	1.4
Graded Grid	N/A	Yes
Grading Ratio	N/A	1.5
MAIA	N/A	N/A
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-10-23	2023-10-23
psSAR1g [W/kg]	9.81	9.75
psSAR10g [W/kg]	5.20	5.05
Power Drift [dB]	-0.07	0.09
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		81.0
Dist 3dB Peak [mm]		9.2
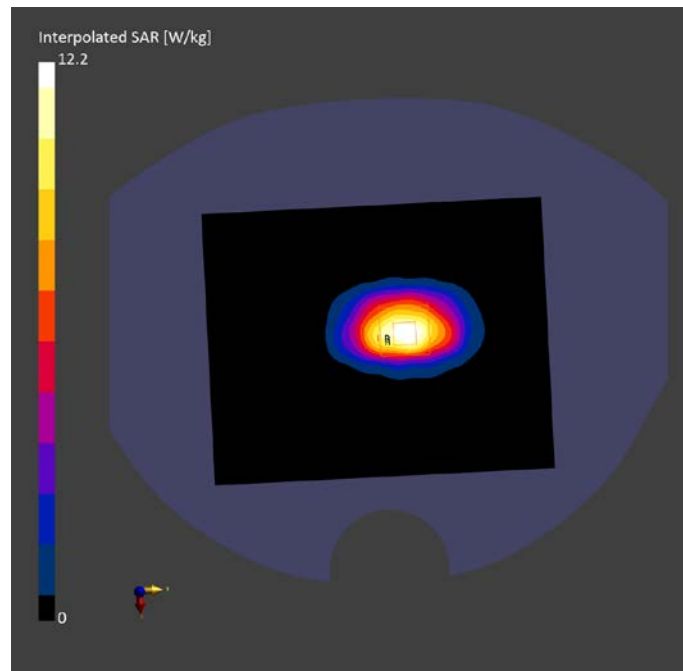
2450MHz

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	BACK, 5.00	CD2450	CW, 0--	2450.000, 50	8.08	1.774	39.74

Hardware Setup

Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Twin-SAM V8.0 (30deg probe tilt) - 2114	HBBL-600-10000	EX3DV4 - SN7727, 2023-06-05	DAE4 Sn1807, 2023-05-15

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	120.0 x 192.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	12.0 x 12.0	5.0 x 5.0 x 1.5
Sensor Surface [mm]	3.0	1.4
Graded Grid	N/A	Yes
Grading Ratio	N/A	1.5
MAIA	N/A	N/A
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-11-03	2023-11-03
psSAR1g [W/kg]	13.35	13.37
psSAR10g [W/kg]	6.25	6.31
Power Drift [dB]	0.10	-0.07
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		79.6
Dist 3dB Peak [mm]		9.0

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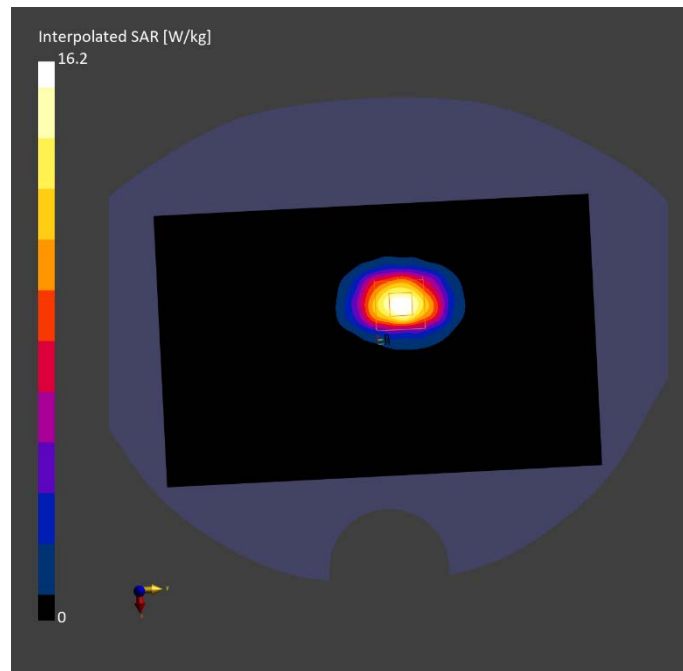
2600MHz

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	BACK, 5.00	D2600	CW, 0--	2600.000, 50	7.9	1.933	38.854

Hardware Setup

Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Twin-SAM V8.0 (30deg probe tilt) - 2114	HBBL-600-10000	EX3DV4 - SN7727, 2023-06-05	DAE4 Sn1807, 2023-05-15

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	120.0 x 192.0	30.0 x 30.0 x 30.0
Grid Steps [mm]	12.0 x 12.0	5.0 x 5.0 x 1.5
Sensor Surface [mm]	3.0	1.4
Graded Grid	N/A	Yes
Grading Ratio	N/A	1.5
MAIA	N/A	N/A
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-11-06	2023-11-06
psSAR1g [W/kg]	13.88	13.58
psSAR10g [W/kg]	6.28	6.22
Power Drift [dB]	-0.07	0.13
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		78.6
Dist 3dB Peak [mm]		9.0

Interpolated SAR [W/kg]
16.8

0
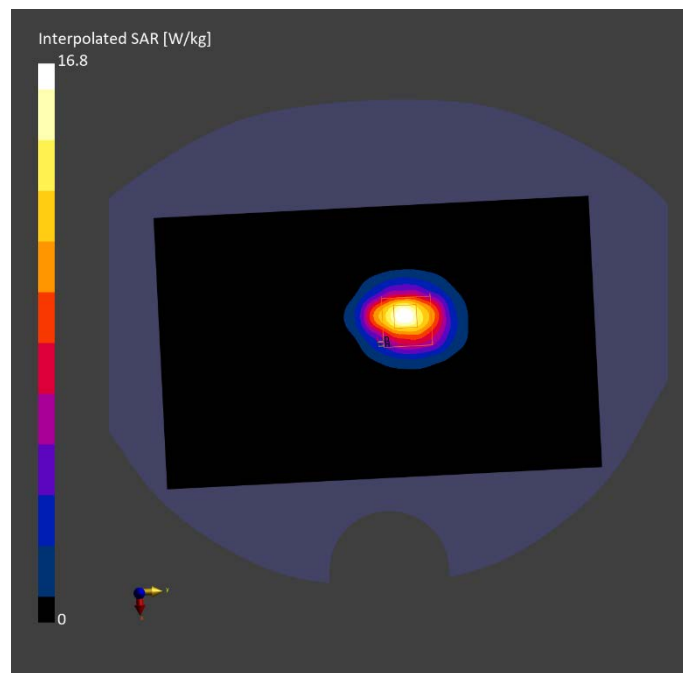
5250MHz

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	BACK, 5.00	D5GHz	CW, 0--	5250.000, 25	5.77	4.658	36.642

Hardware Setup

Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Twin-SAM V8.0 (30deg probe tilt) - 2114	HBBL-600-10000	EX3DV4 - SN7727, 2023-06-05	DAE4 Sn1807, 2023-05-15

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	120.0 x 200.0	22.0 x 22.0 x 22.0
Grid Steps [mm]	10.0 x 10.0	4.0 x 4.0 x 1.4
Sensor Surface [mm]	3.0	1.4
Graded Grid	N/A	Yes
Grading Ratio	N/A	1.4
MAIA	N/A	N/A
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-11-11	2023-11-11
psSAR1g [W/kg]	7.89	7.85
psSAR10g [W/kg]	2.26	2.25
Power Drift [dB]	0.13	-0.09
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		65.3
Dist 3dB Peak [mm]		6.5

Interpolated SAR [W/kg]
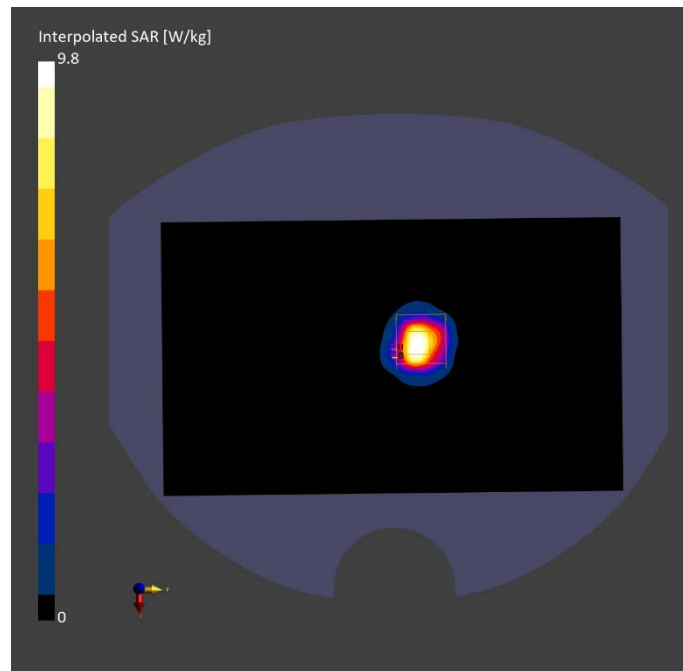
5600MHz

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	BACK, 5.00	D5GHz	CW, 0--	5600.000, 60	5.25	5.143	35.34

Hardware Setup

Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Twin-SAM V8.0 (30deg probe tilt) - 2114	HBBL-600-10000	EX3DV4 - SN7727, 2023-06-05	DAE4 Sn1807, 2023-05-15

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	120.0 x 200.0	22.0 x 22.0 x 22.0
Grid Steps [mm]	10.0 x 10.0	4.0 x 4.0 x 1.4
Sensor Surface [mm]	3.0	1.4
Graded Grid	N/A	Yes
Grading Ratio	N/A	1.4
MAIA	N/A	N/A
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-11-12	2023-11-12
psSAR1g [W/kg]	8.29	8.53
psSAR10g [W/kg]	2.29	2.44
Power Drift [dB]	0.15	-0.05
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		62.3
Dist 3dB Peak [mm]		6.5

Interpolated SAR [W/kg]
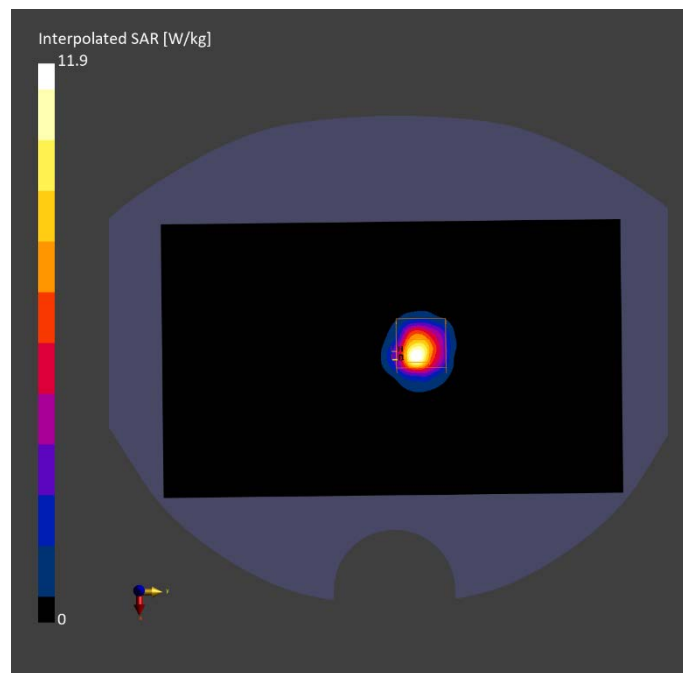
5750MHz

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat, HSL	BACK, 5.00	D5GHz	CW, 0--	5750.000, 75	5.33	5.23	34.421

Hardware Setup

Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Twin-SAM V8.0 (30deg probe tilt) - 2114	HBBL-600-10000	EX3DV4 - SN7727, 2023-06-05	DAE4 Sn1807, 2023-05-15

Scan Setup

	Area Scan	Zoom Scan
Grid Extents [mm]	120.0 x 200.0	22.0 x 22.0 x 22.0
Grid Steps [mm]	10.0 x 10.0	4.0 x 4.0 x 1.4
Sensor Surface [mm]	3.0	1.4
Graded Grid	N/A	Yes
Grading Ratio	N/A	1.4
MAIA	N/A	N/A
Surface Detection	VMS + 6p	VMS + 6p
Scan Method	Measured	Measured

Measurement Results

	Area Scan	Zoom Scan
Date	2023-11-14	2023-11-14
psSAR1g [W/kg]	8.23	7.98
psSAR10g [W/kg]	2.35	2.25
Power Drift [dB]	-0.11	0.13
Power Scaling	Disabled	Disabled
Scaling Factor [dB]		
TSL Correction	No correction	No correction
M2/M1 [%]		61.5
Dist 3dB Peak [mm]		6.6
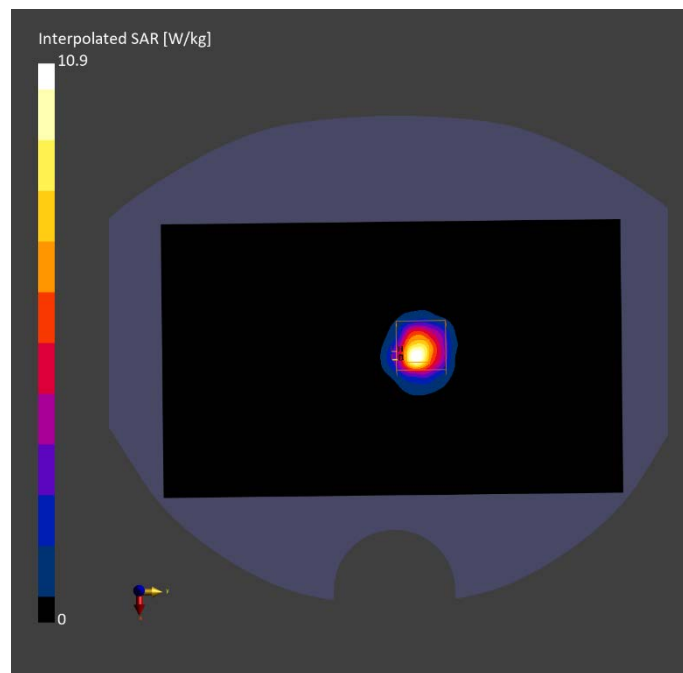
ANNEX C SAR Measurement Setup

C.1 Measurement Set-up

The Dasy4 or DASY5 system for performing compliance tests is illustrated above graphically. This system consists of the following items:
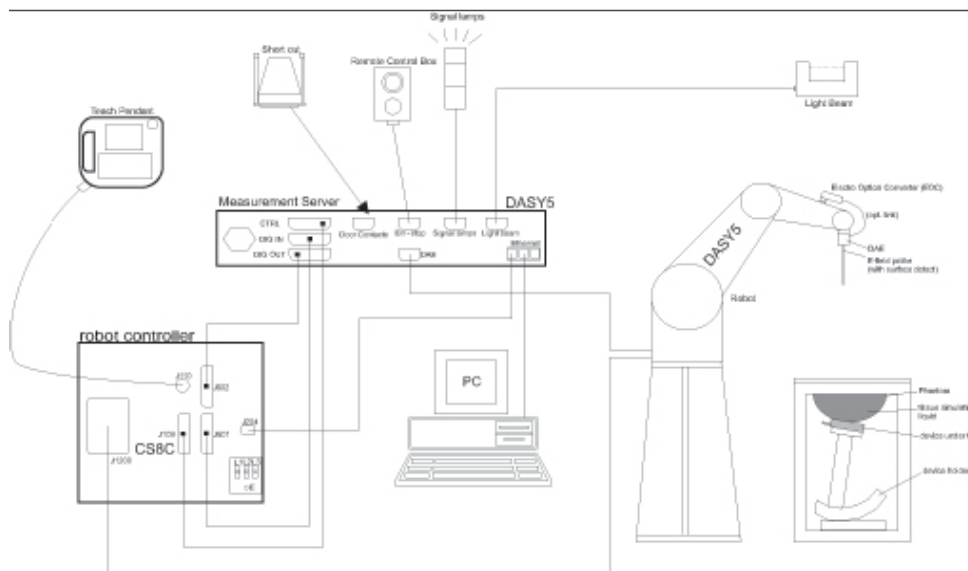
Picture C.1SAR Lab Test Measurement Set-up

- A standard high precision 6-axis robot (StäubliTX=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 DASY4 or 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 Dasy4 or 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 DASY4 or DASY5 software reads the reflection durning a software approach and looks for the maximum using 2nd ord 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

DynamicRange: 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 ofmobile phones
Dosimetry in strong gradient fields

Picture C.2Near-field Probe

Picture C.3E-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/cm^2) 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 inn 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 equates to 1 mW/cm^2.

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/m^3).

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 (DASY4: RX90XL; 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.5DASY 4

Picture C.6DASY 5

C.4.3 Measurement Server

The Measurement server is based on a PC/104 CPU broad with CPU (dasy4: 166 MHz, Intel Pentium; DASY5: 400 MHz, Intel Celeron), chipdisk (DASY4: 32 MB; DASY5: 128MB), RAM (DASY4: 64 MB, 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 broad, which is directly connected to the PC/104 bus of the CPU broad.

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.7 Server for DASY 4

Picture C.8 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 ±0.5mm would produce a SAR uncertainty of ±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 are 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 ε =3 and loss tangent δ =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.9-1: Device Holder
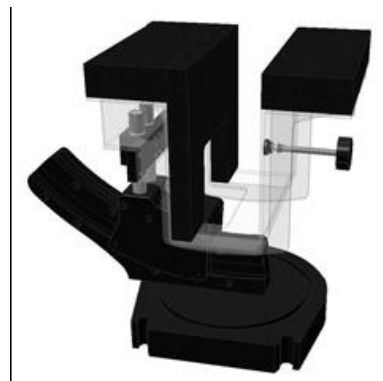
Picture C.9-2: Laptop Extension Kit

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

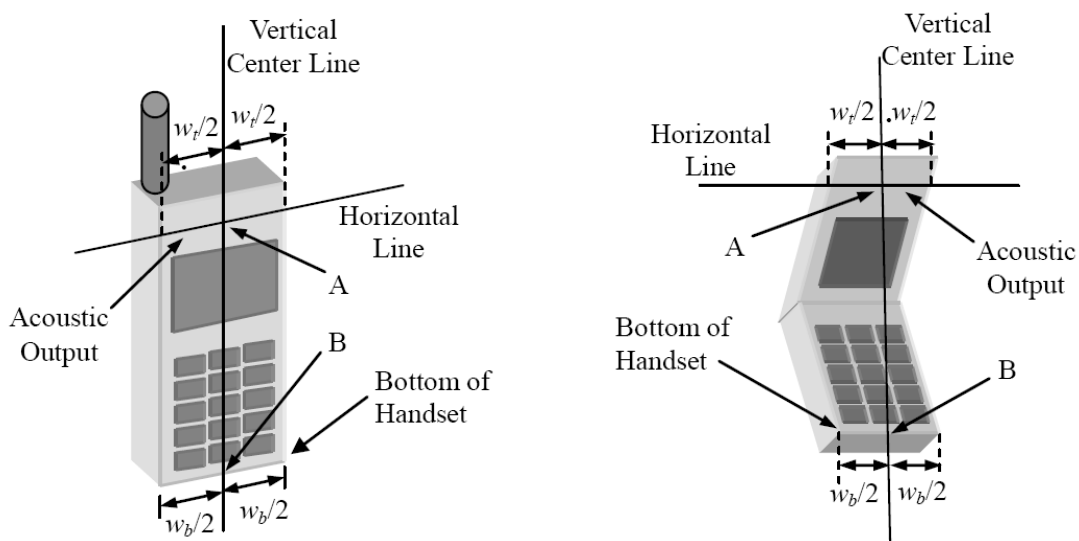Dimensions: 810 x l000 x 500 mm (H x L x W)

Available: Special

Picture C.10: SAM Twin Phantom

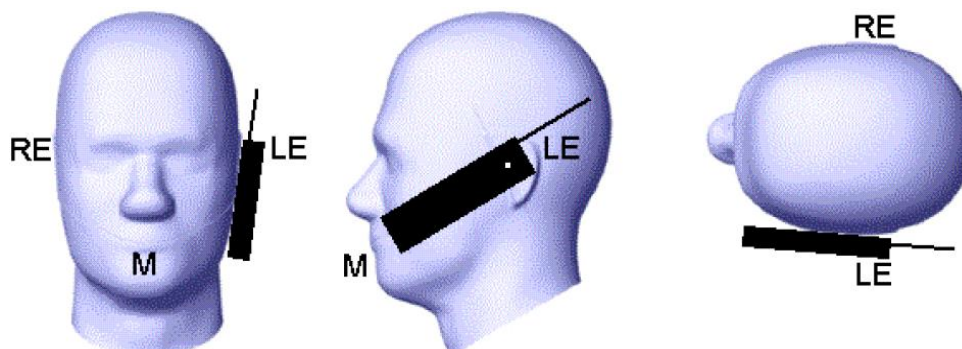# ANNEX D Position of the wireless device in relation to the phantom

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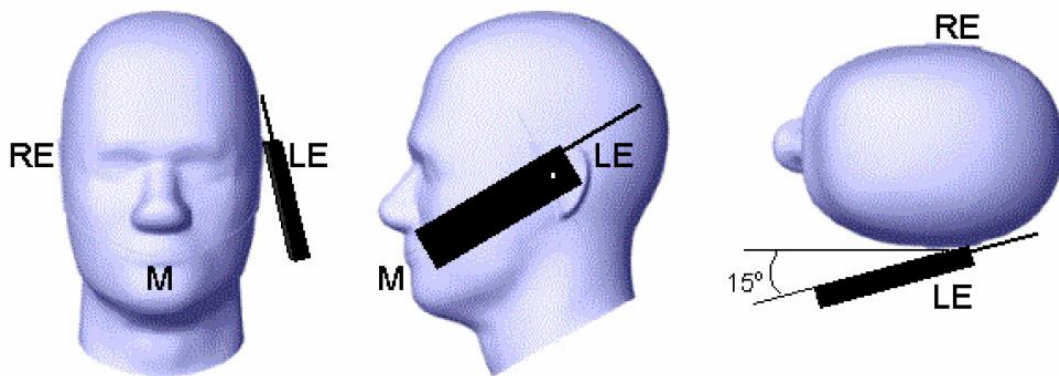
Picture D.3 Tilt position of the wireless device on the left side of SAM

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.
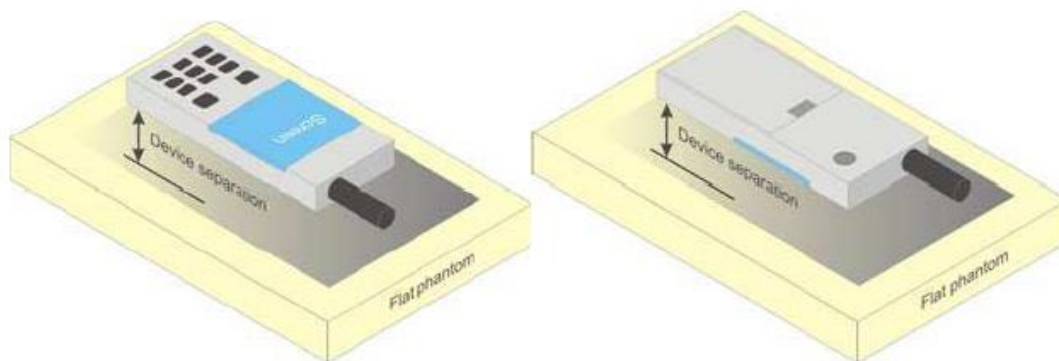

Picture D.4Test positions for body-worn devices

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. Picture8.5 show positions for desktop device SAR tests. If the intended use is not specified, the device shall be tested directly against the flat phantom.
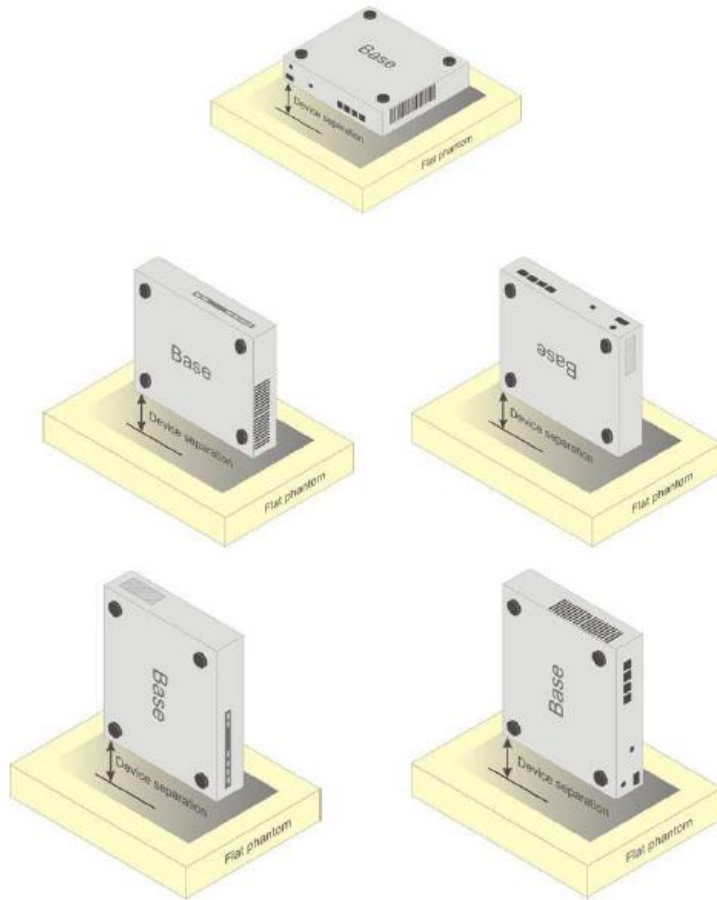
Picture D.5 Test positions for desktop devices

D.4 DUT Setup Photos

Picture D.6

ANNEX E Equivalent Media Recipes

The liquid used for the frequency range of 800-3000 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.

TableE.1: Composition of the Tissue Equivalent Matter

Frequency (MHz)	835Head	835Body	1900 Head	1900 Body	2450 Head	2450 Body	5800 Head	5800 Body
Ingredients (% by weight)								
Water	41.45	52.5	55.242	69.91	58.79	72.60	65.53	65.53
Sugar	56.0	45.0	\	\	\	\	\	\
Salt	1.45	1.4	0.306	0.13	0.06	0.18	\	\
Preventol	0.1	0.1	\	\	\	\	\	\
Cellulose	1.0	1.0	\	\	\	\	\	\
Glycol Monobutyl	\	\	44.452	29.96	41.15	27.22	\	\
Diethylenglycol monohexylether	\	\	\	\	\	\	17.24	17.24
Triton X-100	\	\	\	\	\	\	17.24	17.24
Dielectric Parameters Target Value	ε=41.5 σ=0.90	ε=55.2 σ=0.97	ε=40.0 σ=1.40	ε=53.3 σ=1.52	ε=39.2 σ=1.80	ε=52.7 σ=1.95	ε=35.3 σ=5.27	ε=48.2 σ=6.00

Note: There are a little adjustment respectively for 750, 1750, 2600, 5200, 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 for 7727

Probe SN.	Liquid name	Validation date	Frequency point	Status (OK or Not)
7727	H650-7000M	July.8,2023	750 MHz	OK
7727	H650-7000M	July.8,2023	900 MHz	OK
7727	H650-7000M	July.8,2023	1450 MHz	OK
7727	H650-7000M	July.8,2023	1750 MHz	OK
7727	H650-7000M	July.9,2023	1900 MHz	OK
7727	H650-7000M	July.9,2023	2100 MHz	OK
7727	H650-7000M	July.9,2023	2300 MHz	OK
7727	H650-7000M	July.11,2023	2450 MHz	OK
7727	H650-7000M	July.11,2023	2600 MHz	OK
7727	H650-7000M	July.11,2023	3500 MHz	OK
7727	H650-7000M	July.11,2023	3700 MHz	OK
7727	H650-7000M	July.11,2023	3900 MHz	OK
7727	H650-7000M	July.12,2023	5250 MHz	OK
7727	H650-7000M	July.12,2023	5600 MHz	OK
7727	H650-7000M	July.12,2023	5800 MHz	OK

ANNEX G Probe Calibration Certificate

Probe 7727 Calibration Certificate

In Collaboration with
TTL speag
CALIBRATION LABORATORY

Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2117
E-mail: emf@caict.ac.cn   http://www.caict.ac.cn

中国认可 **CAICT**
国际互认
校准 **CALIBRATION**
CNAS L0570

Client	CTTL		Certificate No:	J23Z60233

CALIBRATION CERTIFICATE

Object	EX3DV4 - SN : 7727
Calibration Procedure(s)	FF-Z11-004-02 Calibration Procedures for Dosimetric E-field Probes
Calibration date:	June 05, 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)℃ 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
OCP	DAK-3.5	SN 1040	18-Jan-23(SPEAG, No.OCP-DAK3.5-1040_Jan23)	Jan-24
Reference Probe	EX3DV4	SN 7517	27-Jan-23(SPEAG, No.EX-7517_Jan23)	Jan-24
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
Reference	10dBAttenuator	BT0520	11-May-23(CTTL, No.J23X04061)	May-25
Reference	20dBAttenuator	BT0267	11-May-23(CTTL, No.J23X04062)	May-25

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

Issued: June 09, 2023

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

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Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2117
E-mail: emf@caict.ac.cn   http://www.caict.ac.cn

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,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 θ=0 is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013

b) IEC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016

c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010

d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization θ=0 (f≤900MHz in TEM-cell; f>1800MHz: waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not effect the E^2-field uncertainty inside TSL (see below ConvF).

- *NORM(f)x,y,z = NORMx,y,z* frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of ConvF.

- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep (no uncertainty required). DCP does not depend on frequency nor media.

- PAR: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics.

- *Ax,y,z; Bx,y,z; Cx,y,z;VRx,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≤800MHz) and inside waveguide using analytical field distributions based on power measurements for f >800MHz. 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 NORMx,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±50MHz to±100MHz.

- *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 *NORMx* (no uncertainty required).

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DASY/EASY – Parameters of Probe: EX3DV4 – SN: 7727

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (*k*=2)
Norm(μV/(V/m)²) A	0.47	0.48	0.38	±10.0%
DCP(mV) B	102.0	105.2	100.5	

Calibration Results for Modulation Response

UID	Communication System Name		A dB	B dB√μV	C	D dB	VR mV	Max Dev.	Max Unc E (*k*=2)
0	CW	X	0.0	0.0	1.0	0.00	168.3	±2.5%	±4.7%
		Y	0.0	0.0	1.0		172.7		
		Z	0.0	0.0	1.0		145.7		
10352-AAA	Pulse Waveform (200Hz, 10%)	X	1.45	60.00	5.24		60	±3.6%	±9.6%
		Y	1.58	60.61	5.86	10.00	60		
		Z	1.36	60.00	5.66		60		
10353-AAA	Pulse Waveform (200Hz, 20%)	X	46.00	72.00	7.00		80	±2.2%	±9.6%
		Y	0.80	60.00	4.25	6.99	80		
		Z	6.00	68.00	7.00		80		
10354-AAA	Pulse Waveform (200Hz, 40%)	X	0.00	69.85	39.37		95	±3.0%	±9.6%
		Y	0.07	160.00	18.62	3.98	95		
		Z	0.00	159.90	19.34		95		
10355-AAA	Pulse Waveform (200Hz, 60%)	X	0.00	113.74	99.96		120	±3.3%	±9.6%
		Y	0.00	64.51	42.10	2.22	120		
		Z	0.51	85.10	0.67		120		
10387-AAA	QPSK Waveform, 1 MHz	X	0.89	160.00	87.59		150	±3.1%	±9.6%
		Y	20.00	142.19	41.78	1.00	150		
		Z	20.00	154.70	47.89		150		
10388-AAA	QPSK Waveform, 10 MHz	X	20.00	134.83	42.45		150	±2.4%	±9.6%
		Y	11.01	103.50	28.52	0.00	150		
		Z	20.00	115.38	32.38		150		
10396-AAA	64-QAM Waveform, 100 kHz	X	2.75	83.44	29.81		150	±1.4%	±9.6%
		Y	1.92	69.46	20.49	3.01	150		
		Z	1.88	69.78	21.20		150		
10414-AAA	WLAN CCDF, 64-QAM, 40MHz	X	5.32	75.63	21.26		150	±3.3%	±9.6%
		Y	4.17	69.30	17.33	0.00	150		
		Z	4.31	70.05	17.92		150		

Note: For details on UID parameters see Appendix

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

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

Certificate No:J23Z60233   Page 3 of 22

DASY/EASY – Parameters of Probe: EX3DV4 – SN: 7727

Sensor Model Parameters

	C1 fF	C2 fF	α V⁻¹	T1 ms.V⁻²	T2 ms.V⁻¹	T3 ms	T4 V⁻²	T5 V⁻¹	T6
X	7.64	55.26	34.90	0.92	0.00	4.90	0.00	0.01	1.01
Y	7.95	57.30	33.78	2.12	0.00	4.90	0.02	0.03	1.01
Z	7.87	57.93	35.18	1.93	0.00	4.90	0.00	0.00	1.01

Header units row: C1 fF, C2 fF, α V^{-1}, T1 $ms.V^{-2}$, T2 $ms.V^{-1}$, T3 ms, T4 V^{-2}, T5 V^{-1}, T6

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	**156.2**
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

DASY/EASY – Parameters of Probe: EX3DV4 – SN:7727

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	10.31	10.31	10.31	0.15	1.35	±12.7%
900	41.5	0.97	9.97	9.97	9.97	0.16	1.35	±12.7%
1450	40.5	1.20	8.97	8.97	8.97	0.12	1.33	±12.7%
1750	40.1	1.37	8.65	8.65	8.65	0.20	1.09	±12.7%
1900	40.0	1.40	8.47	8.47	8.47	0.24	1.05	±12.7%
2100	39.8	1.49	8.45	8.45	8.45	0.22	1.11	±12.7%
2300	39.5	1.67	8.30	8.30	8.30	0.61	0.66	±12.7%
2450	39.2	1.80	8.08	8.08	8.08	0.55	0.72	±12.7%
2600	39.0	1.96	7.90	7.90	7.90	0.41	0.86	±12.7%
3300	38.2	2.71	7.44	7.44	7.44	0.38	1.02	±13.9%
3500	37.9	2.91	7.23	7.23	7.23	0.42	1.00	±13.9%
3700	37.7	3.12	7.02	7.02	7.02	0.41	1.00	±13.9%
3900	37.5	3.32	6.91	6.91	6.91	0.35	1.35	±13.9%
4100	37.2	3.53	6.82	6.82	6.82	0.30	1.38	±13.9%
4200	37.1	3.63	6.72	6.72	6.72	0.30	1.50	±13.9%
4400	36.9	3.84	6.62	6.62	6.62	0.30	1.50	±13.9%
4600	36.7	4.04	6.54	6.54	6.54	0.40	1.30	±13.9%
4800	36.4	4.25	6.55	6.55	6.55	0.30	1.80	±13.9%
4950	36.3	4.40	6.20	6.20	6.20	0.40	1.38	±13.9%
5250	35.9	4.71	5.77	5.77	5.77	0.40	1.45	±13.9%
5600	35.5	5.07	5.25	5.25	5.25	0.45	1.40	±13.9%
5750	35.4	5.22	5.33	5.33	5.33	0.40	1.50	±13.9%

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

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

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Frequency Response of E-Field
(TEM-Cell: ifi110 EXX, Waveguide: R22)
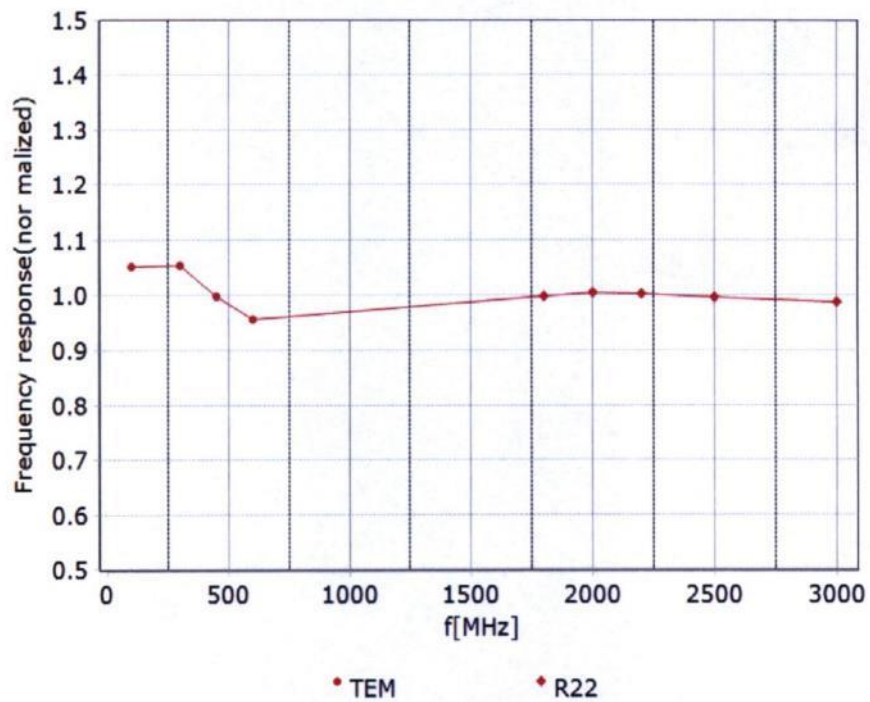
Uncertainty of Frequency Response of E-field: ±7.4% (*k*=2)

Receiving Pattern (Φ), θ=0°

f=600 MHz, TEM

f=1800 MHz, R22

-- Tot   -- X   -- Y   -- Z

-- Tot   -- X   -- Y   -- Z

-- 100MHz   -- 600MHz   -- 1800MHz   -- 2500MHz
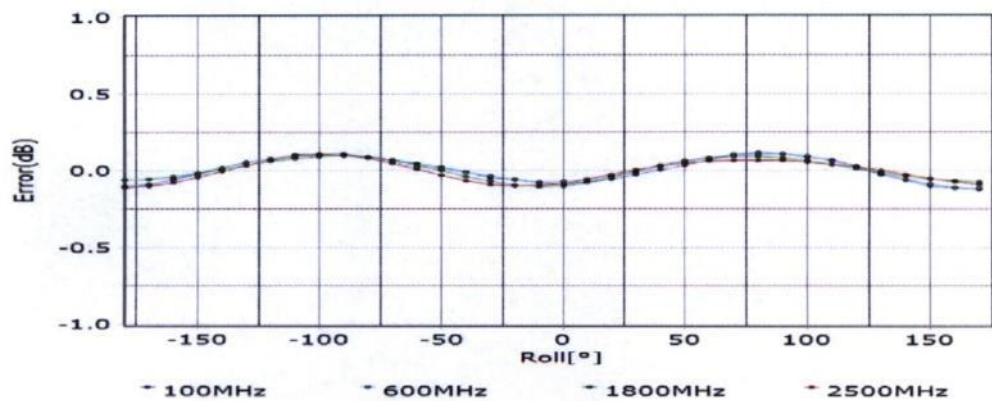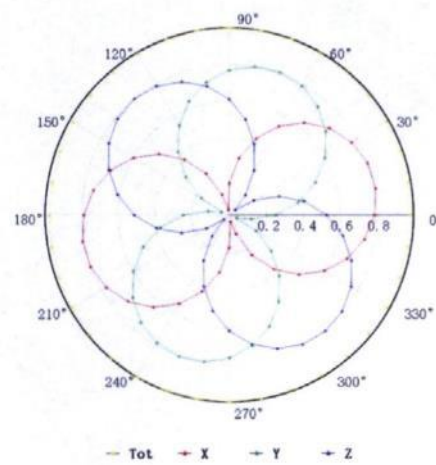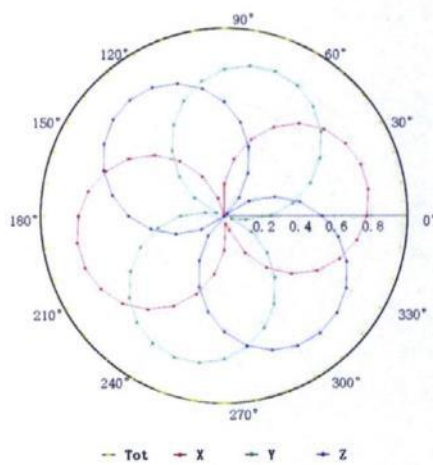
Uncertainty of Axial Isotropy Assessment: ±1.2% (k=2)