

MEASUREMENT 7

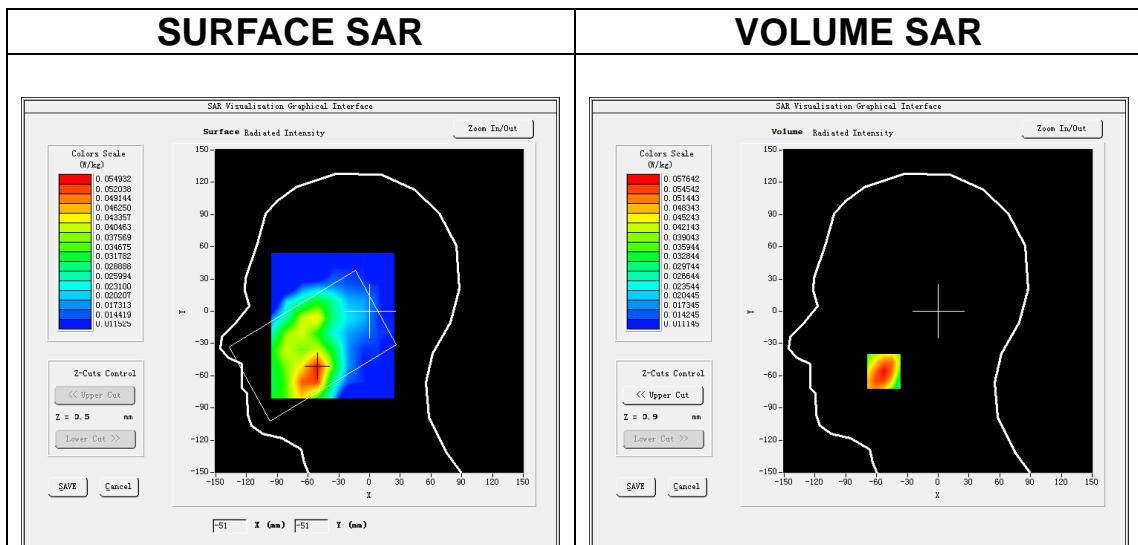
Date of measurement: 6/12/2023

A. Experimental conditions.

Area Scan	<u>dx=15mm dy=15mm, h= 5.00 mm</u>
ZoomScan	<u>5x5x7, dx=8mm dy=8mm dz=5mm</u>
Phantom	<u>Left head</u>
Device Position	<u>Cheek</u>
Band	<u>Band4_WCDMA1700</u>
Channels	<u>Middle</u>
Signal	<u>WCDMA (Crest factor: 1.0)</u>
ConvF	<u>2.45</u>

B. SAR Measurement Results

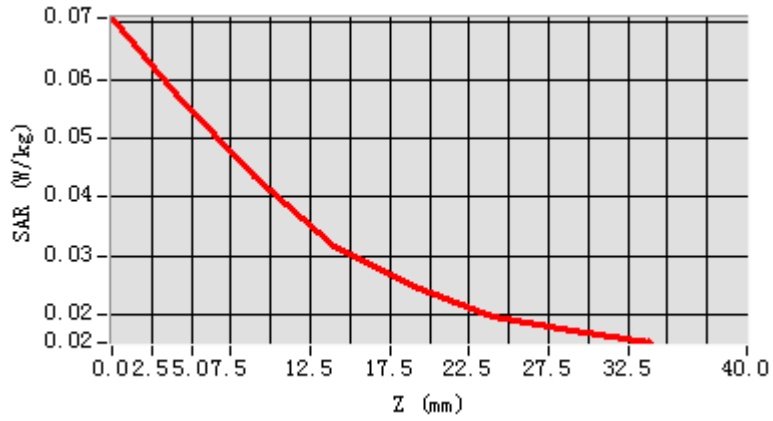
Frequency (MHz)	1732.600000
Relative permittivity (real part)	40.099331
Relative permittivity (imaginary part)	13.878571
Conductivity (S/m)	1.335427
Variation (%)	0.310000



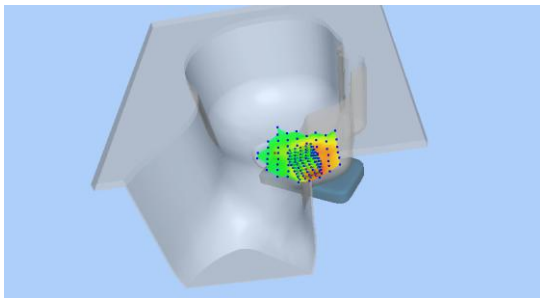
Maximum location: X=-53.00, Y=-56.00
SAR Peak: 0.07 W/kg

SAR 10g (W/Kg)	0.038587
SAR 1g (W/Kg)	0.055026

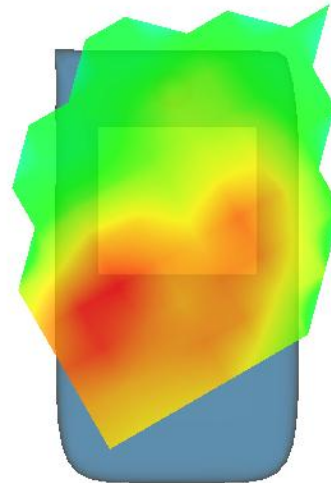
Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.0707	0.0576	0.0437	0.0317	0.0247	0.0197	0.0172



3D screen shot



Hot spot position



MEASUREMENT 8

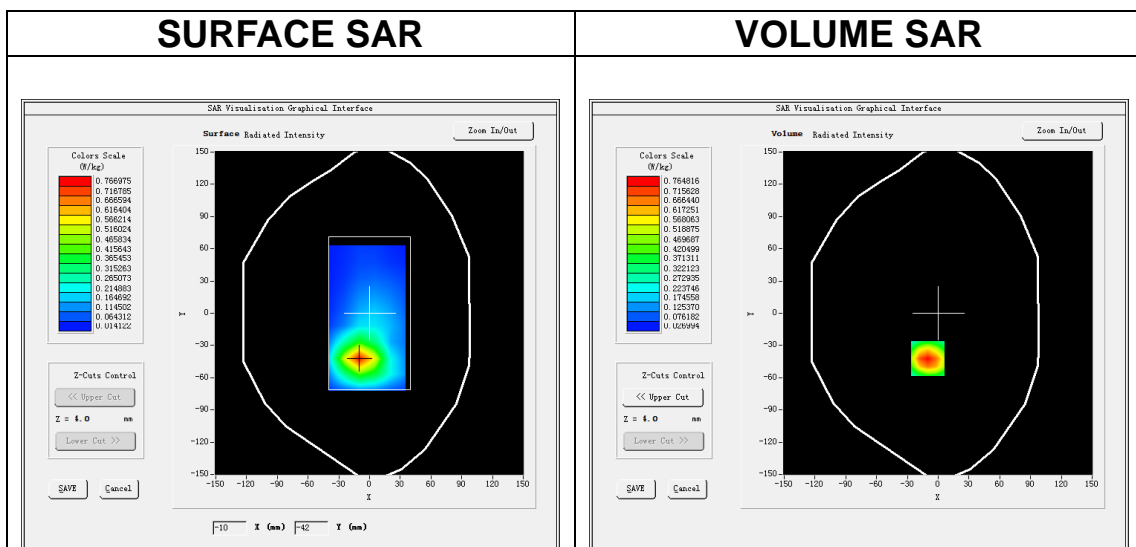
Date of measurement: 6/12/2023

A. Experimental conditions.

Area Scan	<u>dx=15mm dy=15mm, h= 5.00 mm</u>
ZoomScan	<u>5x5x7, dx=8mm dy=8mm dz=5mm</u>
Phantom	<u>Validation plane</u>
Device Position	<u>Body</u>
Band	<u>Band4_WCDMA1700</u>
Channels	<u>Middle</u>
Signal	<u>WCDMA (Crest factor: 1.0)</u>
ConvF	<u>2.45</u>

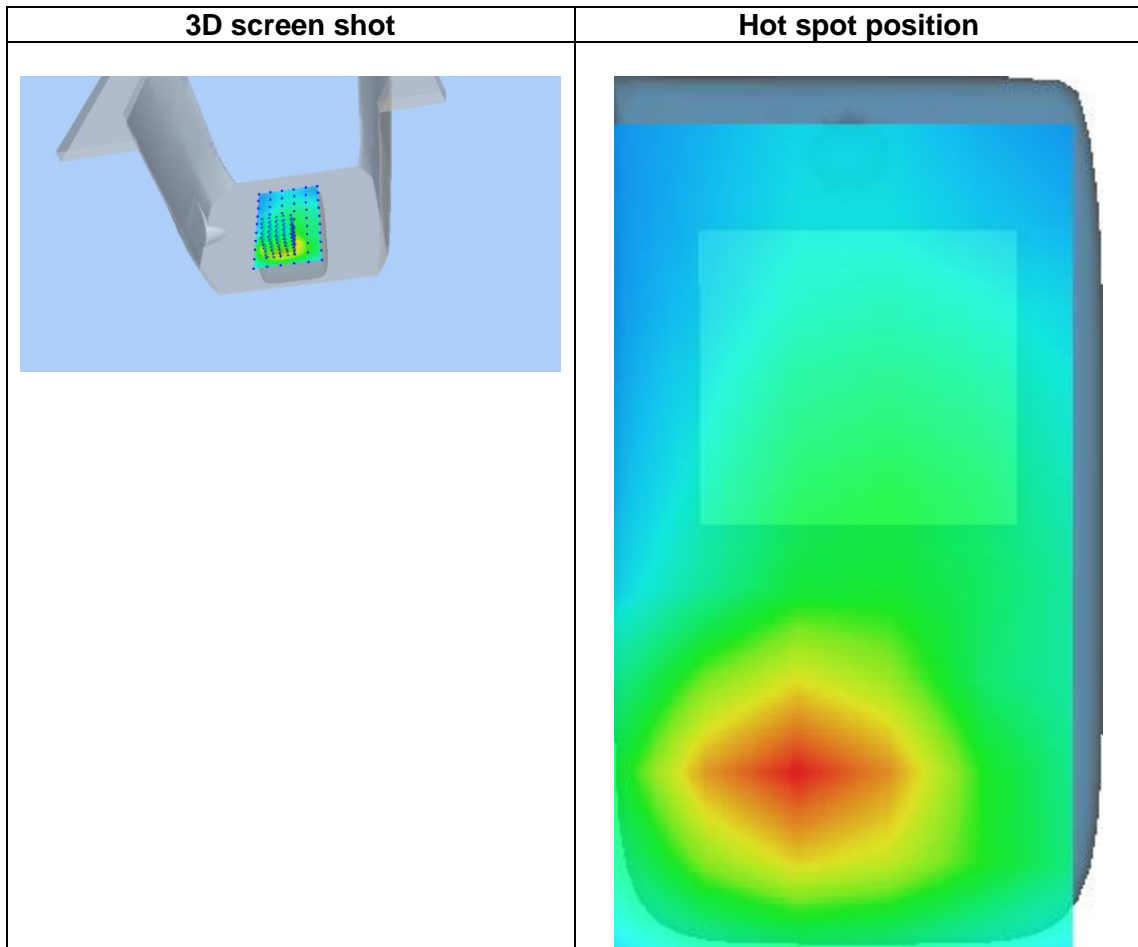
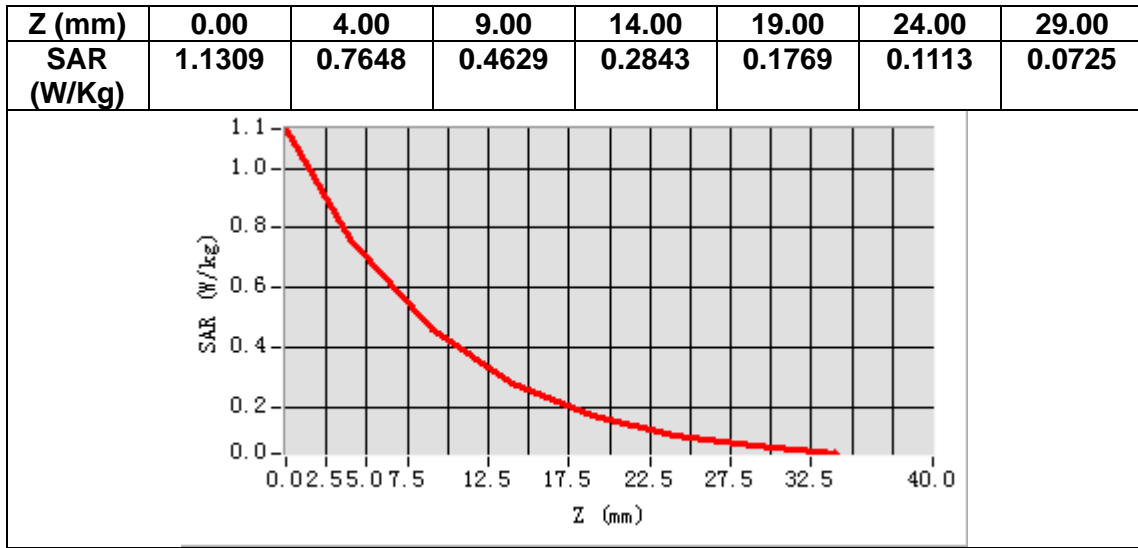
B. SAR Measurement Results

Frequency (MHz)	1732.600000
Relative permittivity (real part)	40.099331
Relative permittivity (imaginary part)	13.878571
Conductivity (S/m)	1.335427
Variation (%)	-0.550000



Maximum location: X=-10.00, Y=-42.00
SAR Peak: 1.14 W/kg

SAR 10g (W/Kg)	0.406681
SAR 1g (W/Kg)	0.727197



MEASUREMENT 9

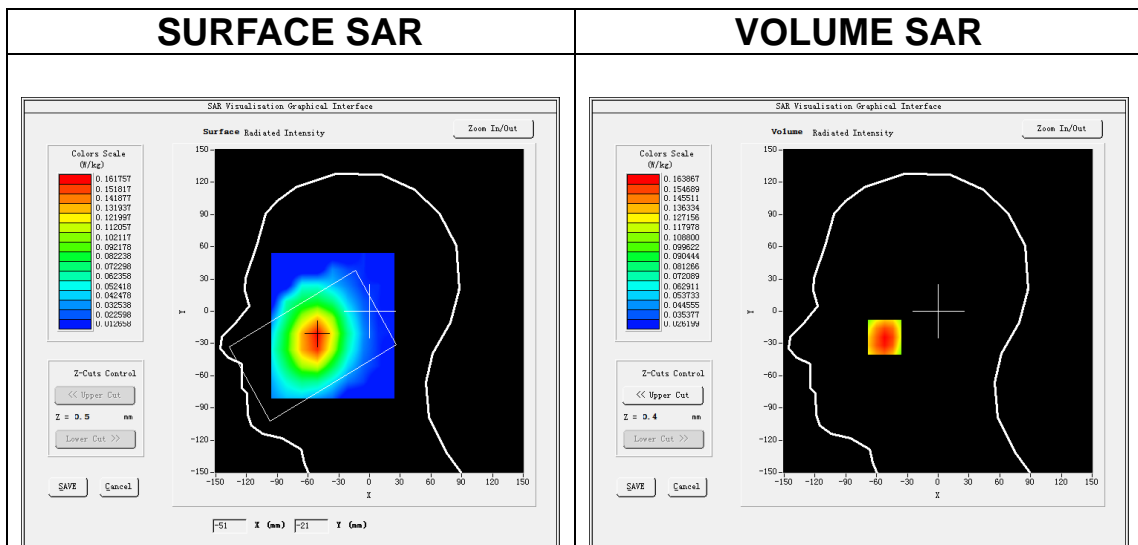
Date of measurement: 24/11/2023

A. Experimental conditions.

<u>Area Scan</u>	<u>dx=15mm dy=15mm, h= 5.00 mm</u>
<u>ZoomScan</u>	<u>5x5x7, dx=8mm dy=8mm dz=5mm</u>
<u>Phantom</u>	<u>Left head</u>
<u>Device Position</u>	<u>Cheek</u>
<u>Band</u>	<u>Band5_WCDMA850</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>WCDMA (Crest factor: 1.0)</u>
<u>ConvF</u>	<u>2.32</u>

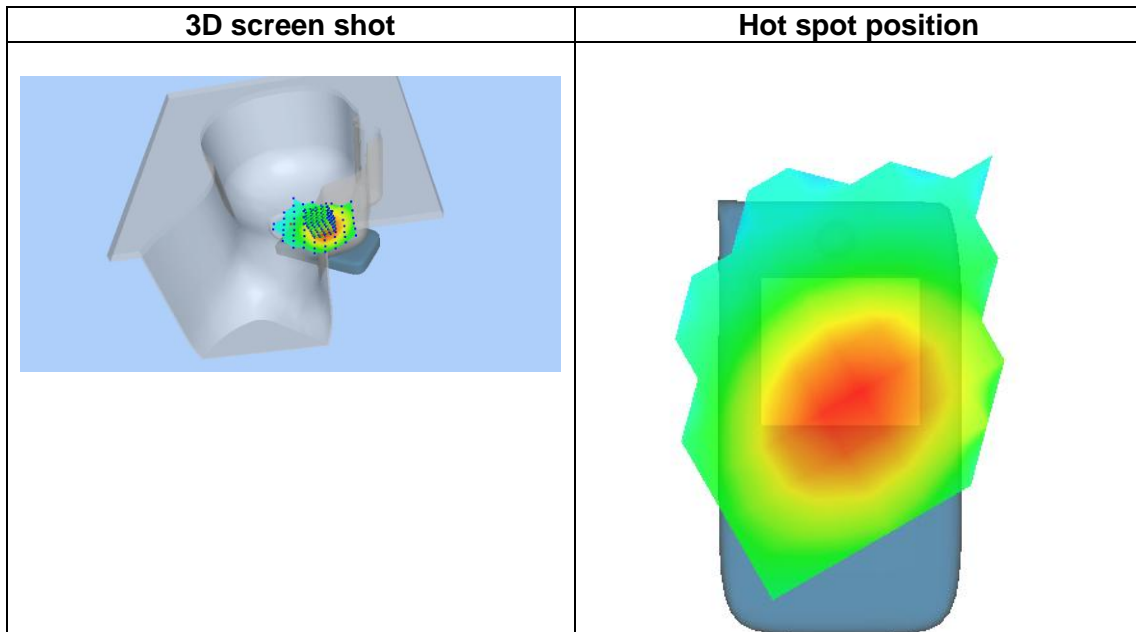
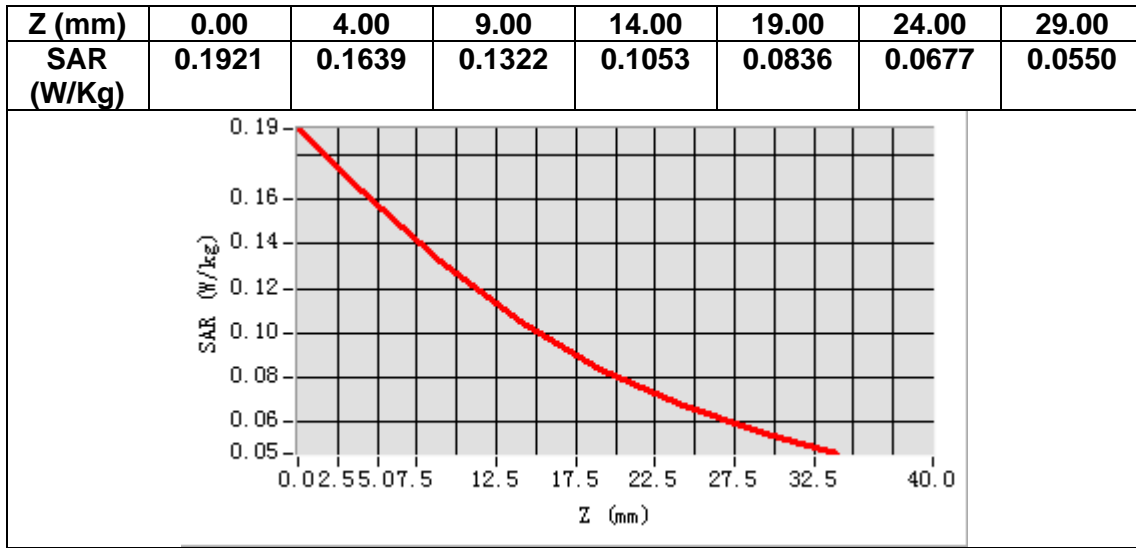
B. SAR Measurement Results

Frequency (MHz)	836.400000
Relative permittivity (real part)	41.562759
Relative permittivity (imaginary part)	19.441196
Conductivity (S/m)	0.903368
Variation (%)	-4.640000



Maximum location: X=-52.00, Y=-24.00
SAR Peak: 0.20 W/kg

SAR 10g (W/Kg)	0.118692
SAR 1g (W/Kg)	0.158907



MEASUREMENT 10

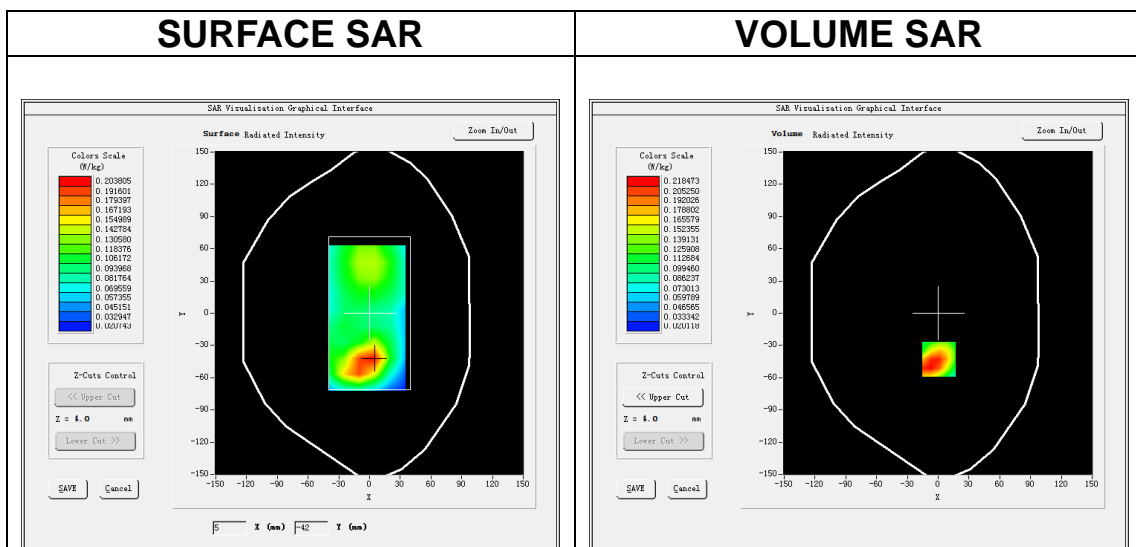
Date of measurement: 24/11/2023

A. Experimental conditions.

Area Scan	<u>dx=15mm dy=15mm, h= 5.00 mm</u>
ZoomScan	<u>5x5x7, dx=8mm dy=8mm dz=5mm</u>
Phantom	<u>Validation plane</u>
Device Position	<u>Body</u>
Band	<u>Band5_WCDMA850</u>
Channels	<u>Middle</u>
Signal	<u>WCDMA (Crest factor: 1.0)</u>
ConvF	<u>2.32</u>

B. SAR Measurement Results

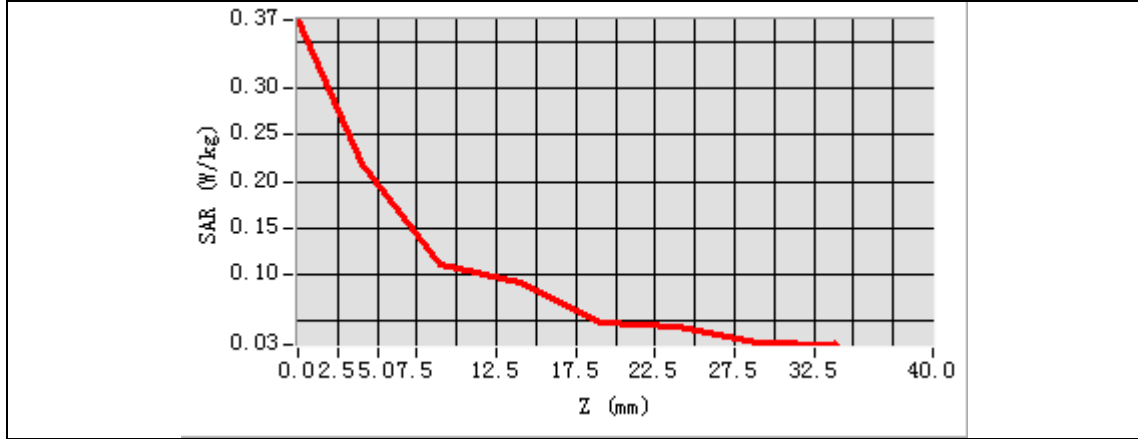
Frequency (MHz)	836.400000
Relative permittivity (real part)	41.562759
Relative permittivity (imaginary part)	19.441196
Conductivity (S/m)	0.903368
Variation (%)	-0.580000



Maximum location: X=1.00, Y=-43.00
SAR Peak: 0.33 W/kg

SAR 10g (W/Kg)	0.128304
SAR 1g (W/Kg)	0.212942

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.3733	0.2185	0.1110	0.0911	0.0496	0.0438	0.0275



3D screen shot	Hot spot position

MEASUREMENT 11

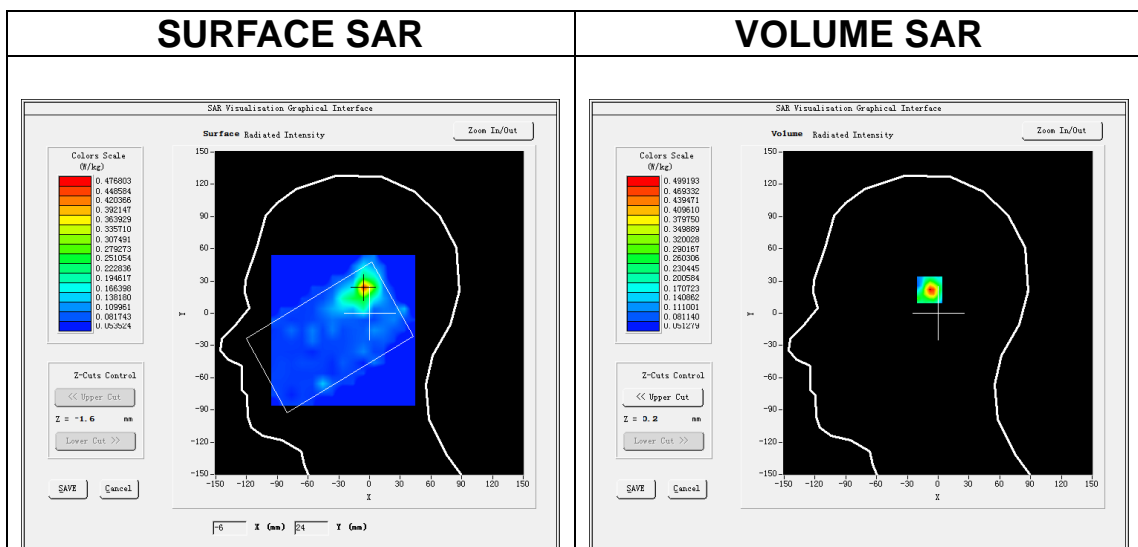
Date of measurement: 21/11/2023

A. Experimental conditions.

Area Scan	<u>dx=10mm dy=10mm, h= 2.00 mm</u>
ZoomScan	<u>7x7x12,dx=4mm dy=4mm dz=2mm</u>
Phantom	<u>Left head</u>
Device Position	<u>Cheek</u>
Band	<u>IEEE 802.11a U-NII</u>
Channels	<u>Low</u>
Signal	<u>IEEE802.11a (Crest factor: 1.0)</u>
ConvF	<u>2.07</u>

B. SAR Measurement Results

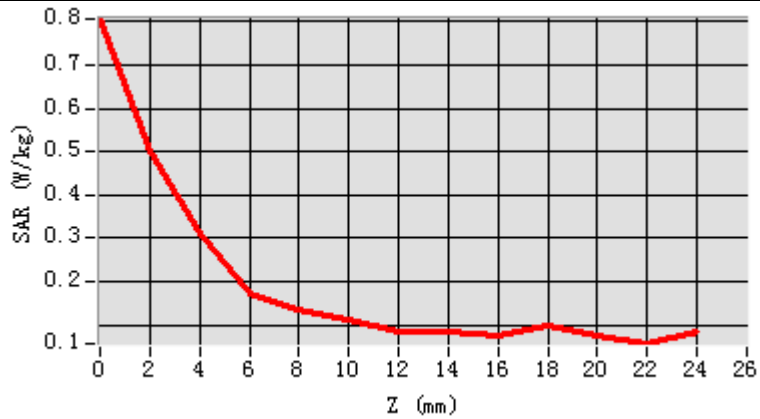
Frequency (MHz)	5180.000000
Relative permittivity (real part)	35.577185
Relative permittivity (imaginary part)	15.590562
Conductivity (S/m)	4.486617
Variation (%)	2.090000



Maximum location: X=-5.00, Y=24.00
SAR Peak: 1.28 W/kg

SAR 10g (W/Kg)	0.189809
SAR 1g (W/Kg)	0.468258

Z (m m)	0.00	2.00	4.00	6.00	8.00	10.0	12.0	14.0	16.0	18.0	20.0	22.0
SAR (W/ Kg)	0.8058	0.4992	0.3131	0.1735	0.1368	0.1132	0.0864	0.0861	0.0776	0.1004	0.0754	0.0571



3D screen shot	Hot spot position

MEASUREMENT 12

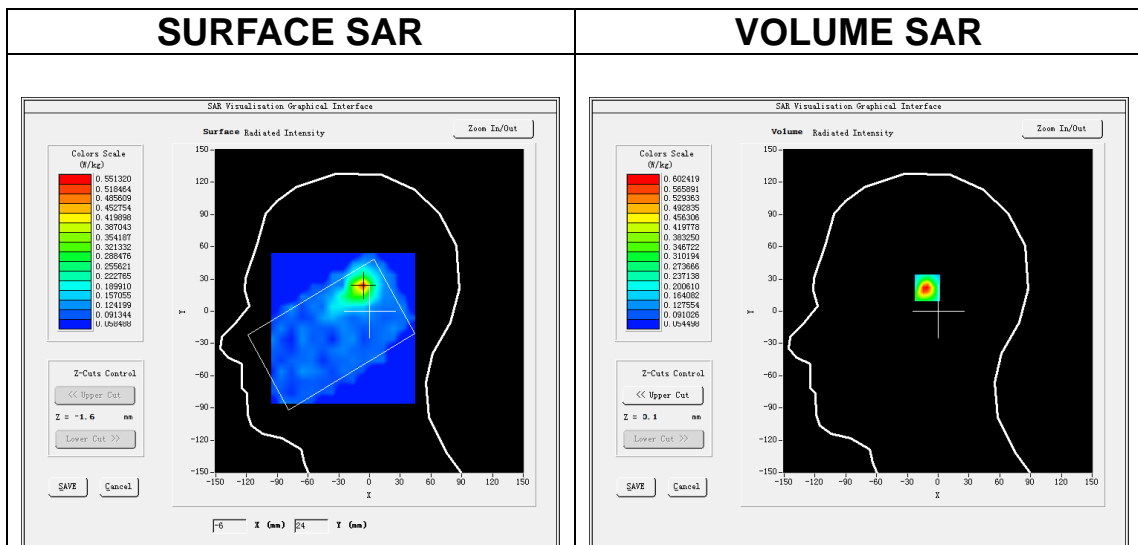
Date of measurement: 8/12/2023

A. Experimental conditions.

Area Scan	<u>dx=10mm dy=10mm, h= 2.00 mm</u>
ZoomScan	<u>7x7x12,dx=4mm dy=4mm dz=2mm</u>
Phantom	<u>Left head</u>
Device Position	<u>Cheek</u>
Band	<u>IEEE 802.11a U-NII</u>
Channels	<u>Low</u>
Signal	<u>IEEE802.11a (Crest factor: 1.0)</u>
ConvF	<u>2.04</u>

B. SAR Measurement Results

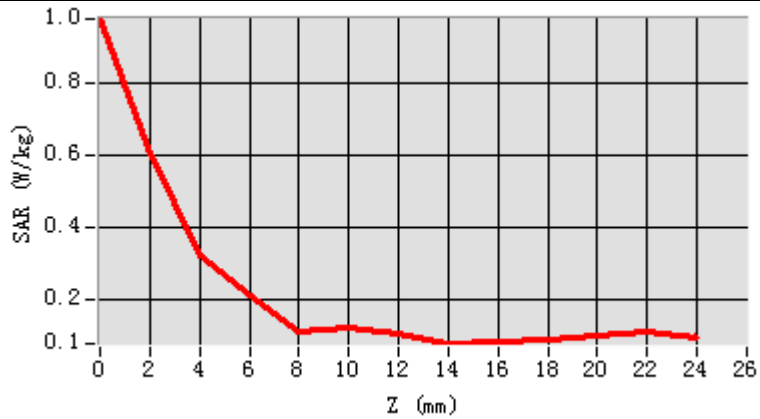
Frequency (MHz)	5745.000000
Relative permittivity (real part)	35.057404
Relative permittivity (imaginary part)	16.447814
Conductivity (S/m)	5.249594
Variation (%)	-0.180000



Maximum location: X=-7.00, Y=24.00
SAR Peak: 1.55 W/kg

SAR 10g (W/Kg)	0.240079
SAR 1g (W/Kg)	0.587288

Z (m m)	0.00	2.00	4.00	6.00	8.00	10.0	12.0	14.0	16.0	18.0	20.0	22.0
SAR (W/Kg)	0.9762	0.6024	0.3217	0.2086	0.1092	0.1228	0.1041	0.0781	0.0861	0.0917	0.0992	0.1121



3D screen shot	Hot spot position

MEASUREMENT 13

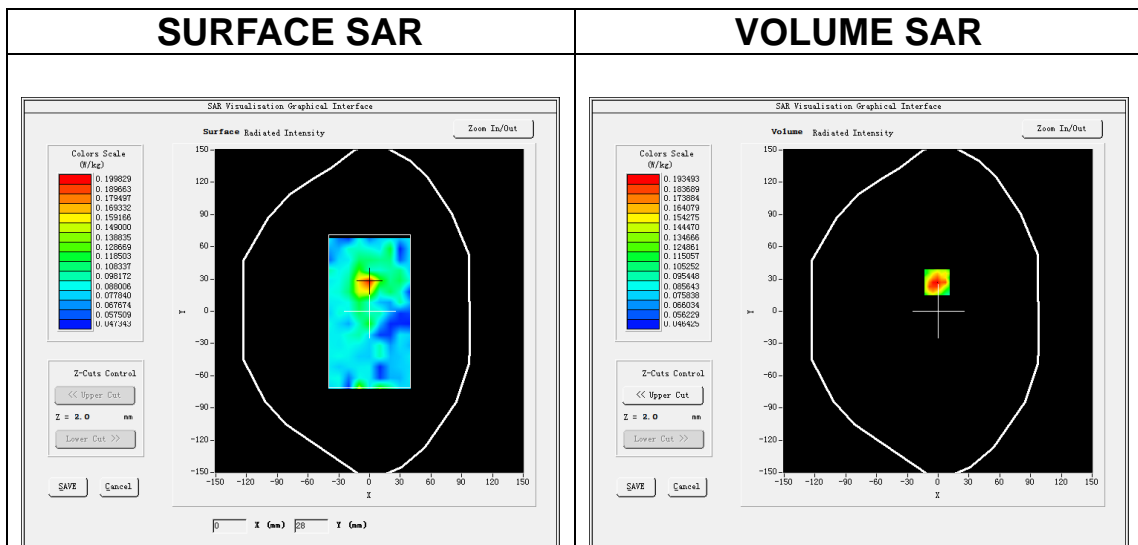
Date of measurement: 21/11/2023

A. Experimental conditions.

Area Scan	<u>dx=10mm dy=10mm, h= 2.00 mm</u>
ZoomScan	<u>7x7x12,dx=4mm dy=4mm dz=2mm</u>
Phantom	<u>Validation plane</u>
Device Position	<u>Body</u>
Band	<u>IEEE 802.11a U-NII</u>
Channels	<u>Low</u>
Signal	<u>IEEE802.11a (Crest factor: 1.0)</u>
ConvF	<u>2.07</u>

B. SAR Measurement Results

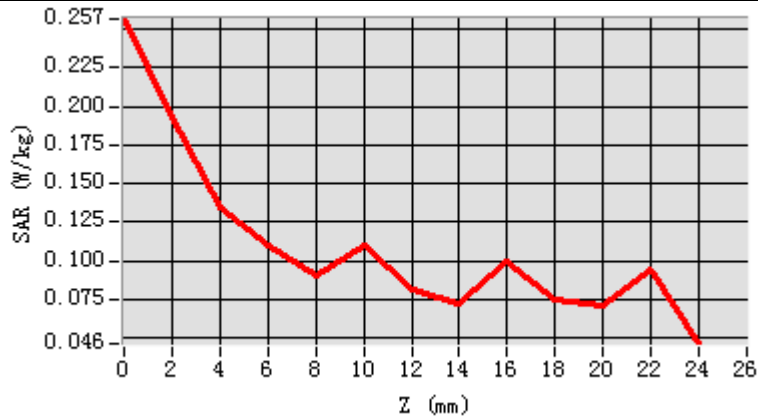
Frequency (MHz)	5180.000000
Relative permittivity (real part)	35.577185
Relative permittivity (imaginary part)	15.590562
Conductivity (S/m)	4.486617
Variation (%)	-1.570000



Maximum location: X=-1.00, Y=27.00
SAR Peak: 0.32 W/kg

SAR 10g (W/Kg)	0.101334
SAR 1g (W/Kg)	0.134821

Z (m m)	0.00	2.00	4.00	6.00	8.00	10.0 0	12.0 0	14.0 0	16.0 0	18.0 0	20.0 0	22.0 0
SAR (W/ Kg)	0.25 65	0.19 35	0.13 40	0.11 05	0.09 03	0.10 98	0.08 21	0.07 26	0.09 98	0.07 55	0.07 14	0.09 39



3D screen shot	Hot spot position

MEASUREMENT 14

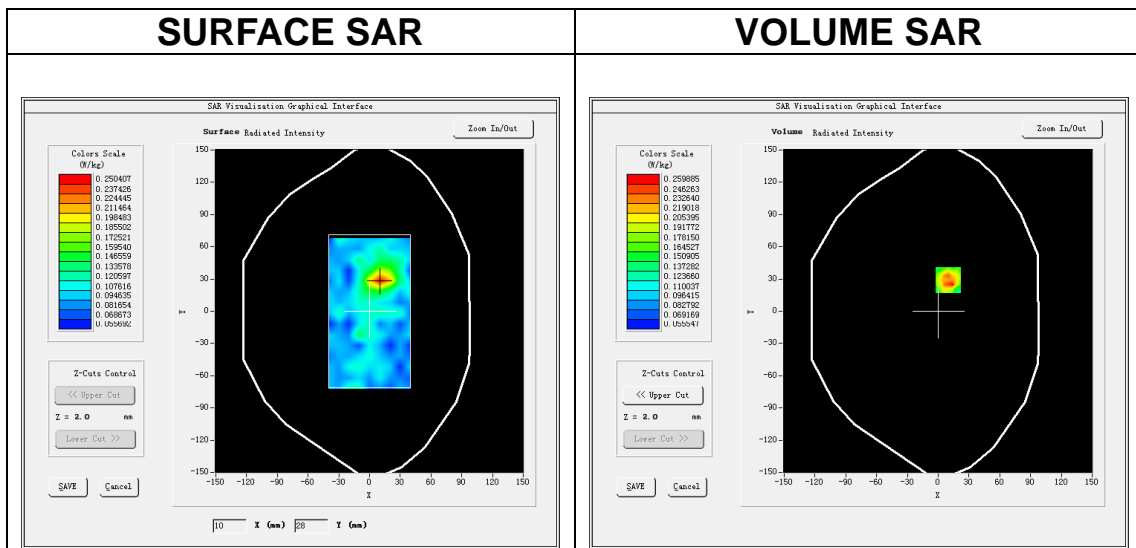
Date of measurement: 8/12/2023

A. Experimental conditions.

Area Scan	<u>dx=10mm dy=10mm, h= 2.00 mm</u>
ZoomScan	<u>7x7x12,dx=4mm dy=4mm dz=2mm</u>
Phantom	<u>Validation plane</u>
Device Position	<u>Body</u>
Band	<u>IEEE 802.11a U-NII</u>
Channels	<u>Low</u>
Signal	<u>IEEE802.11a (Crest factor: 1.0)</u>
ConvF	<u>2.04</u>

B. SAR Measurement Results

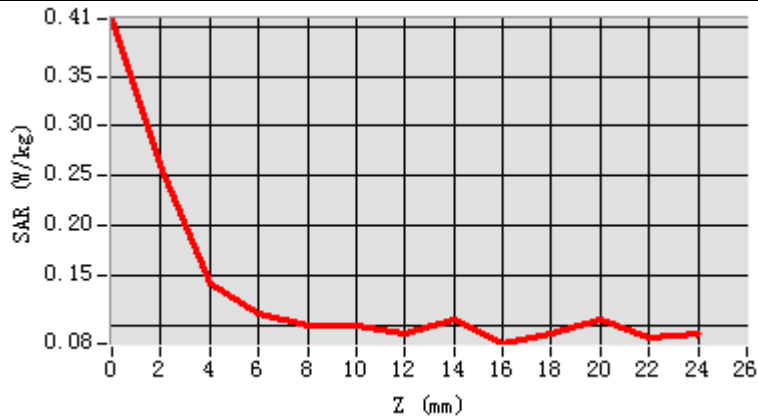
Frequency (MHz)	5745.000000
Relative permittivity (real part)	35.057404
Relative permittivity (imaginary part)	16.447814
Conductivity (S/m)	5.249594
Variation (%)	3.920000



Maximum location: X=10.00, Y=29.00
SAR Peak: 0.42 W/kg

SAR 10g (W/Kg)	0.123036
SAR 1g (W/Kg)	0.169527

Z (m m)	0.00	2.00	4.00	6.00	8.00	10.00	12.00	14.00	16.00	18.00	20.00	22.00
SAR (W/Kg)	0.4075	0.2599	0.1419	0.1116	0.1002	0.1004	0.0908	0.1053	0.0817	0.0913	0.1060	0.0878



<p style="text-align: center;">3D screen shot</p>	<p style="text-align: center;">Hot spot position</p>
--	---

MEASUREMENT 15

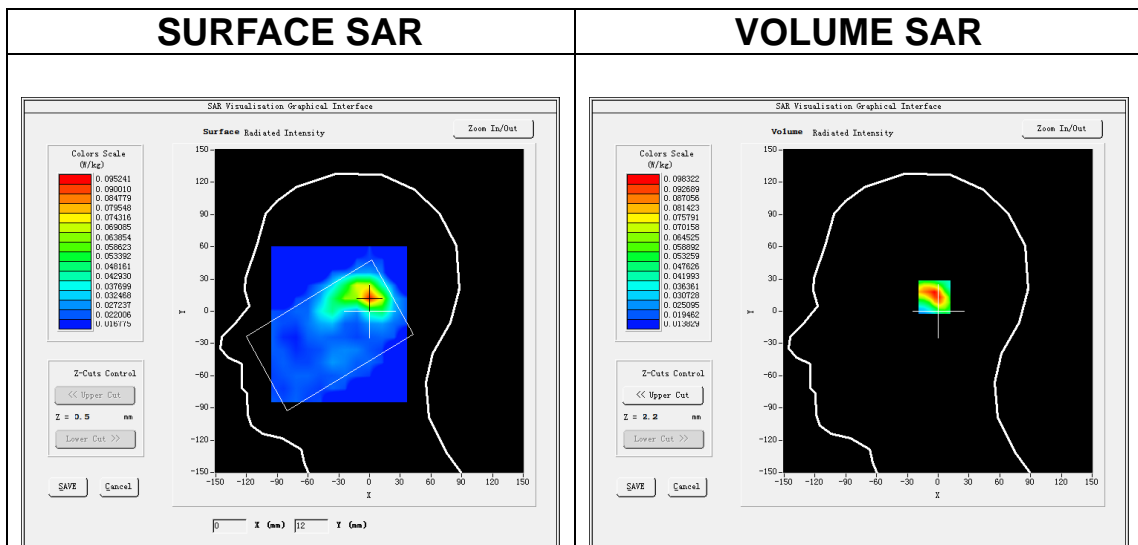
Date of measurement: 7/12/2023

A. Experimental conditions.

Area Scan	<u>dx=12mm dy=12mm, h= 5.00 mm</u>
ZoomScan	<u>7x7x7,dx=5mm dy=5mm dz=5mm</u>
Phantom	<u>Left head</u>
Device Position	<u>Cheek</u>
Band	<u>IEEE 802.11b ISM</u>
Channels	<u>High</u>
Signal	<u>IEEE802.11b (Crest factor: 1.0)</u>
ConvF	<u>2.85</u>

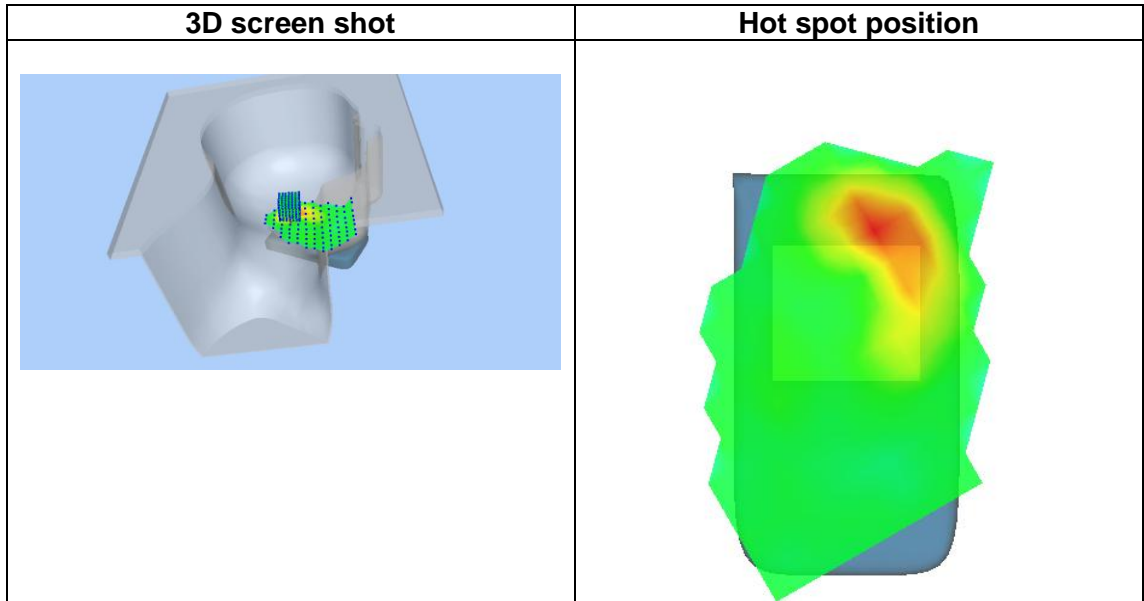
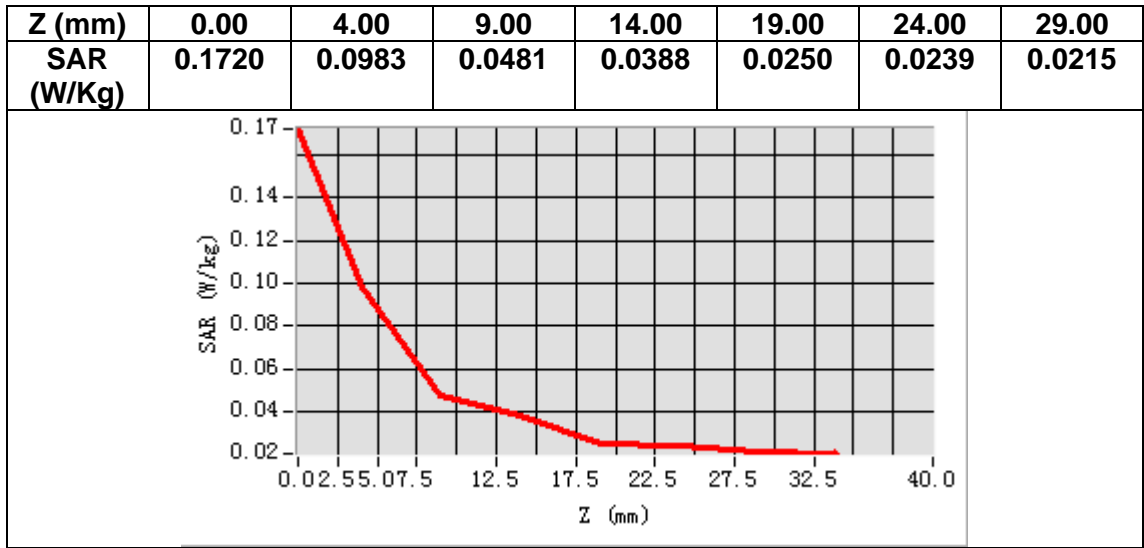
B. SAR Measurement Results

Frequency (MHz)	2462.000000
Relative permittivity (real part)	38.435761
Relative permittivity (imaginary part)	13.039994
Conductivity (S/m)	1.783581
Variation (%)	3.960000



Maximum location: X=0.00, Y=13.00
SAR Peak: 0.15 W/kg

SAR 10g (W/Kg)	0.052404
SAR 1g (W/Kg)	0.089647



MEASUREMENT 16

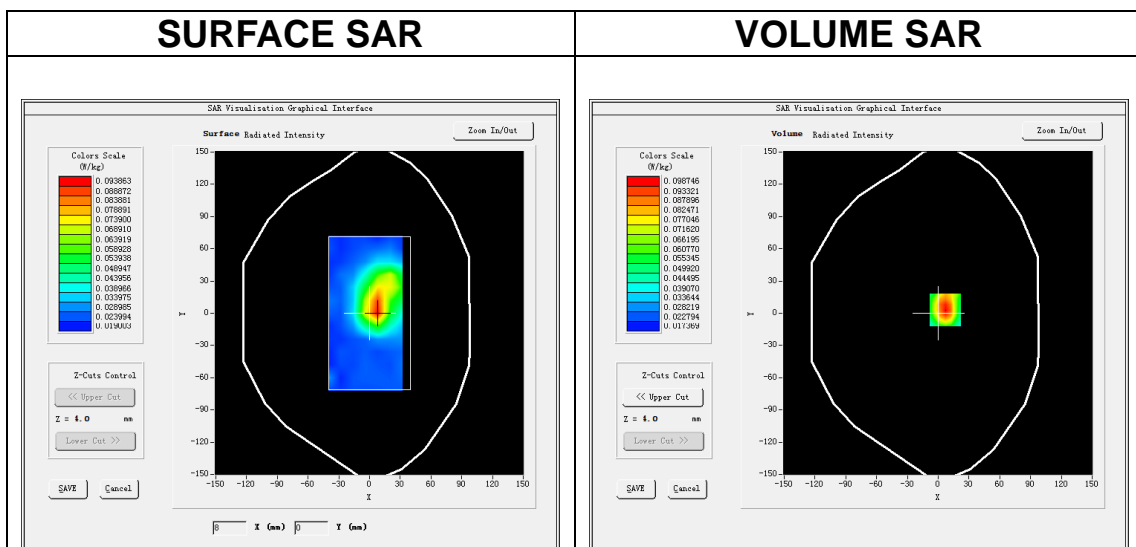
Date of measurement: 7/12/2023

A. Experimental conditions.

Area Scan	<u>dx=12mm dy=12mm, h= 5.00 mm</u>
ZoomScan	<u>7x7x7,dx=5mm dy=5mm dz=5mm</u>
Phantom	<u>Validation plane</u>
Device Position	<u>Body</u>
Band	<u>IEEE 802.11b ISM</u>
Channels	<u>High</u>
Signal	<u>IEEE802.11b (Crest factor: 1.0)</u>
ConvF	<u>2.85</u>

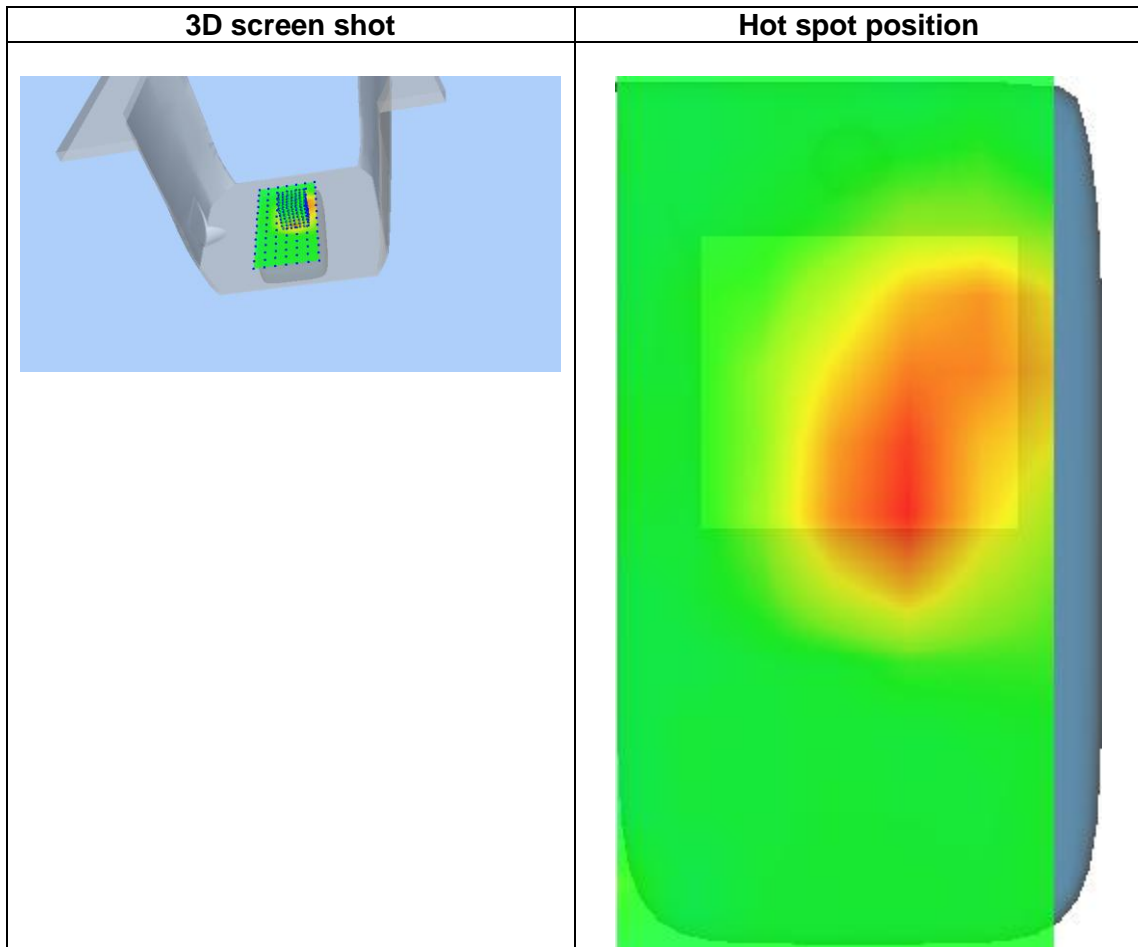
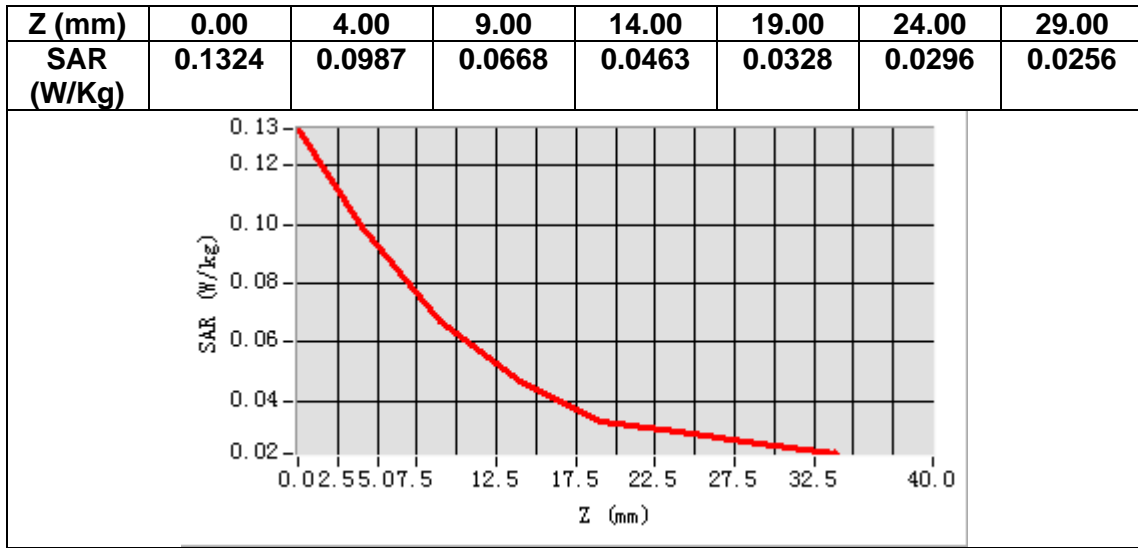
B. SAR Measurement Results

Frequency (MHz)	2462.000000
Relative permittivity (real part)	38.435761
Relative permittivity (imaginary part)	13.039994
Conductivity (S/m)	1.783581
Variation (%)	-0.050000



Maximum location: X=7.00, Y=3.00
SAR Peak: 0.14 W/kg

SAR 10g (W/Kg)	0.057199
SAR 1g (W/Kg)	0.090427



MEASUREMENT 17

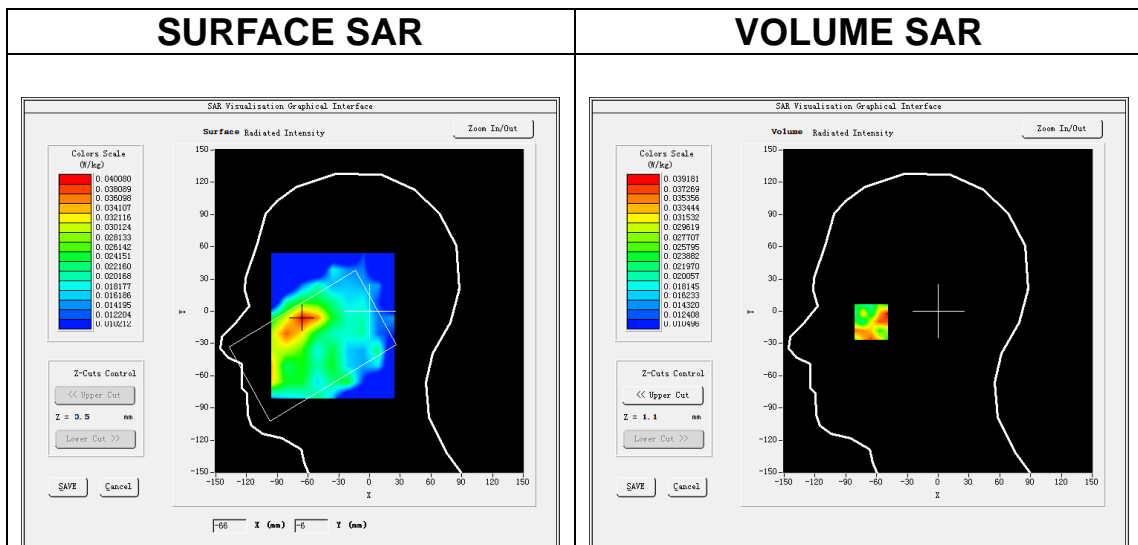
Date of measurement: 23/11/2023

A. Experimental conditions.

Area Scan	<u>dx=15mm dy=15mm, h= 5.00 mm</u>
ZoomScan	<u>5x5x7, dx=8mm dy=8mm dz=5mm</u>
Phantom	<u>Left head</u>
Device Position	<u>Cheek</u>
Band	<u>LTE band 2</u>
Channels	<u>Middle</u>
Signal	<u>LTE (Crest factor: 1.0)</u>
ConvF	<u>2.63</u>

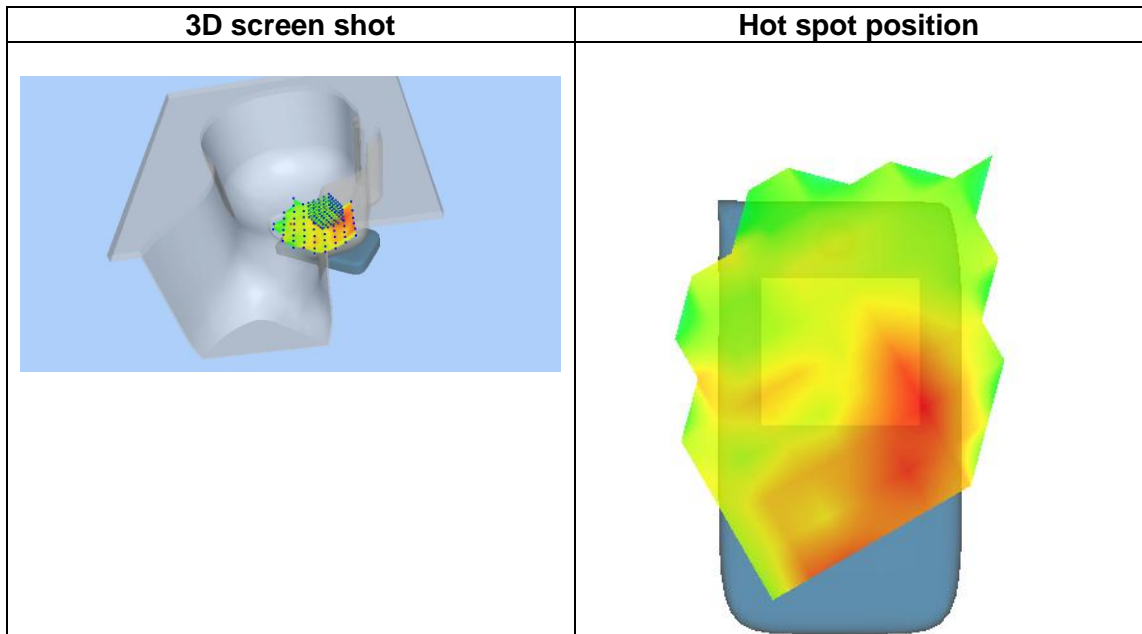
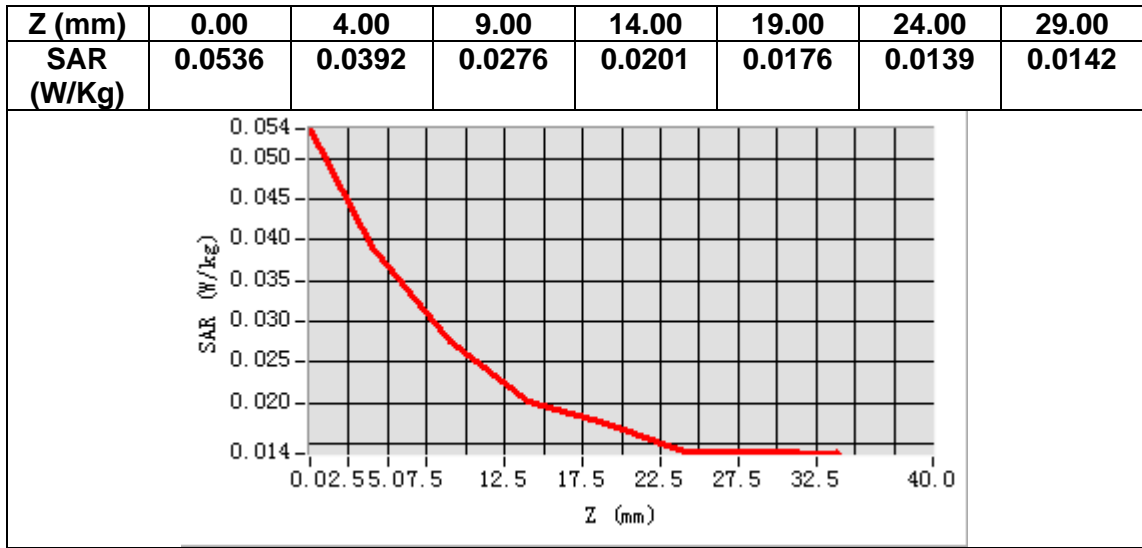
B. SAR Measurement Results

Frequency (MHz)	1880.000000
Relative permittivity (real part)	39.200699
Relative permittivity (imaginary part)	13.839800
Conductivity (S/m)	1.445490
Variation (%)	3.250000



Maximum location: X=-65.00, Y=-7.00
SAR Peak: 0.08 W/kg

SAR 10g (W/Kg)	0.026448
SAR 1g (W/Kg)	0.041181



MEASUREMENT 18

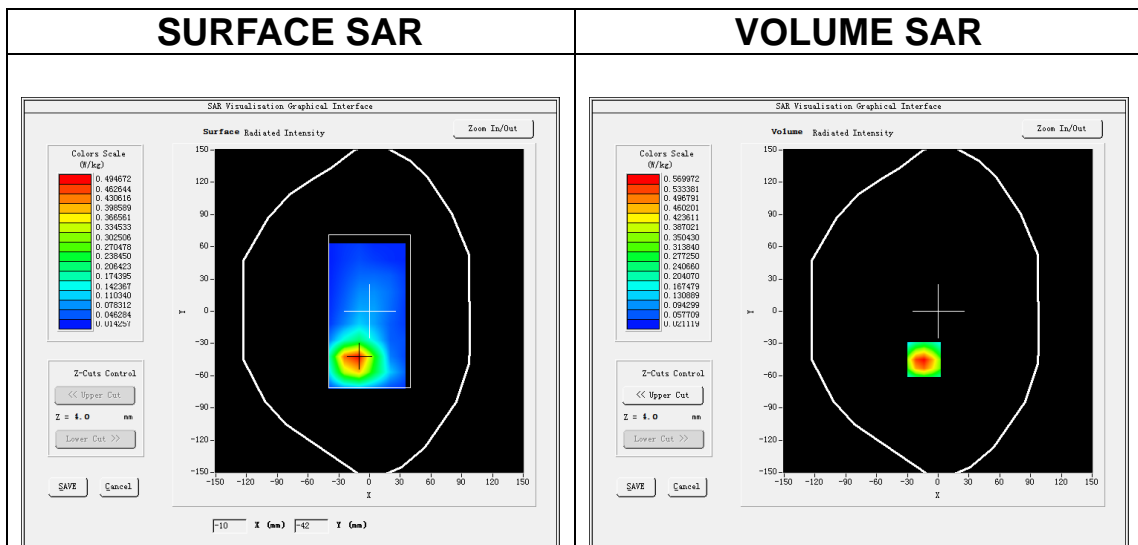
Date of measurement: 23/11/2023

A. Experimental conditions.

<u>Area Scan</u>	<u>dx=15mm dy=15mm, h= 5.00 mm</u>
<u>ZoomScan</u>	<u>5x5x7, dx=8mm dy=8mm dz=5mm</u>
<u>Phantom</u>	<u>Validation plane</u>
<u>Device Position</u>	<u>Body</u>
<u>Band</u>	<u>LTE band 2</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>LTE (Crest factor: 1.0)</u>
<u>ConvF</u>	<u>2.63</u>

B. SAR Measurement Results

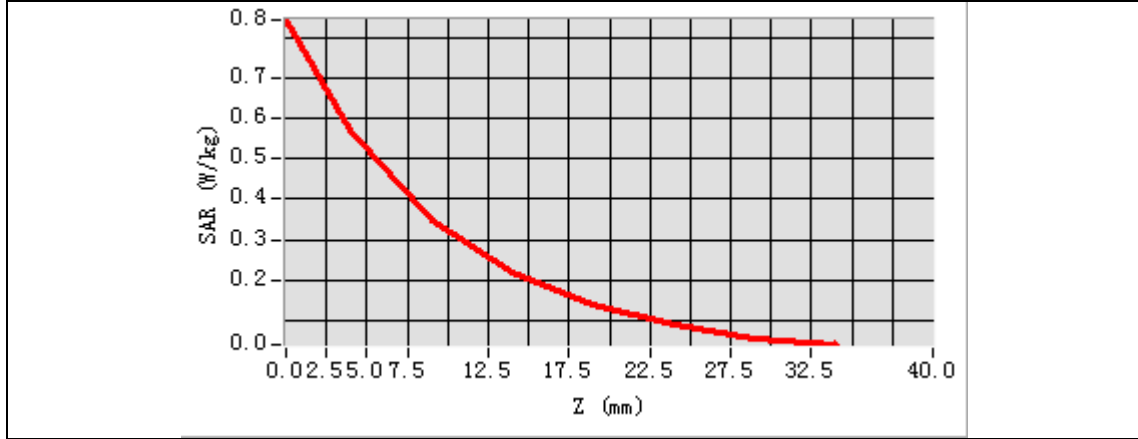
Frequency (MHz)	1880.000000
Relative permittivity (real part)	39.200699
Relative permittivity (imaginary part)	13.839800
Conductivity (S/m)	1.445490
Variation (%)	0.260000



Maximum location: X=-14.00, Y=-45.00
SAR Peak: 0.88 W/kg

SAR 10g (W/Kg)	0.303172
SAR 1g (W/Kg)	0.561240

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.8444	0.5700	0.3475	0.2168	0.1374	0.0873	0.0555



3D screen shot	Hot spot position

MEASUREMENT 19

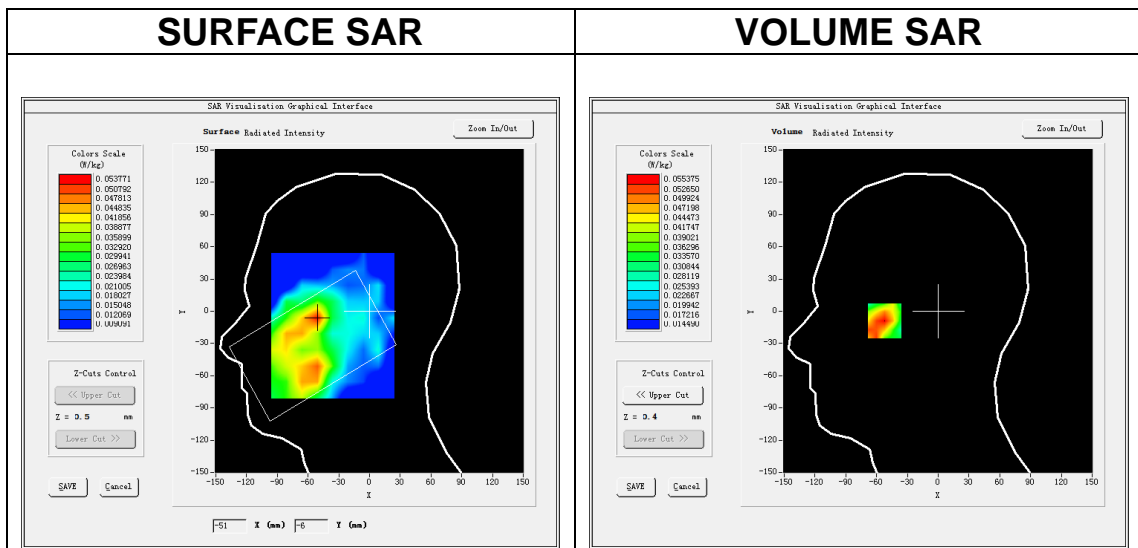
Date of measurement: 6/12/2023

A. Experimental conditions.

<u>Area Scan</u>	<u>dx=15mm dy=15mm, h= 5.00 mm</u>
<u>ZoomScan</u>	<u>5x5x7, dx=8mm dy=8mm dz=5mm</u>
<u>Phantom</u>	<u>Left head</u>
<u>Device Position</u>	<u>Cheek</u>
<u>Band</u>	<u>LTE band 4</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>LTE (Crest factor: 1.0)</u>
<u>ConvF</u>	<u>2.45</u>

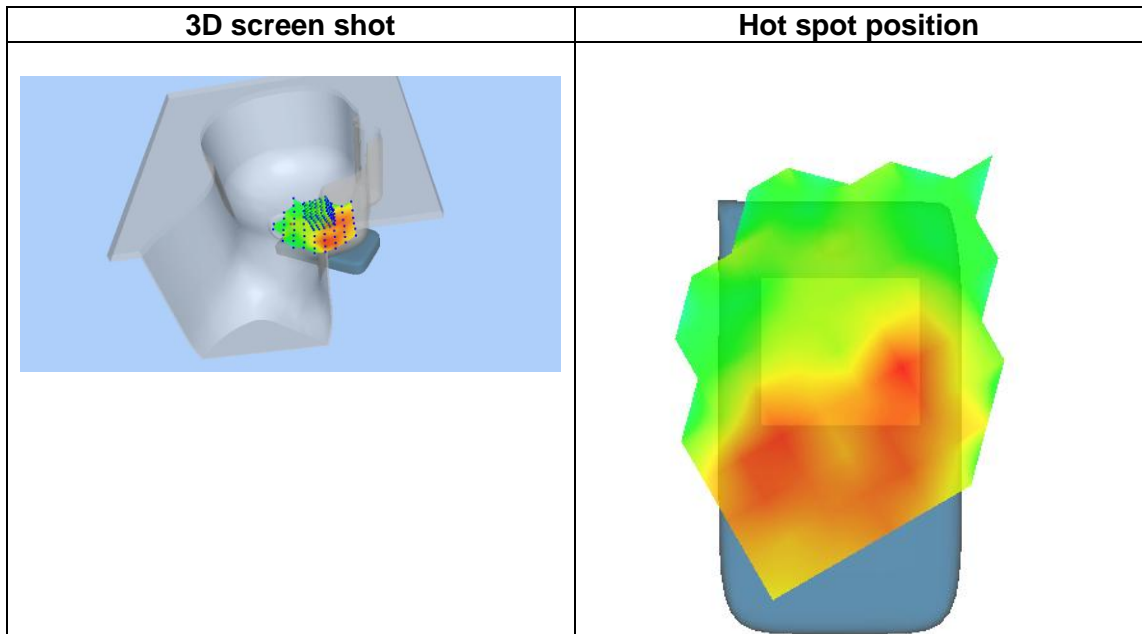
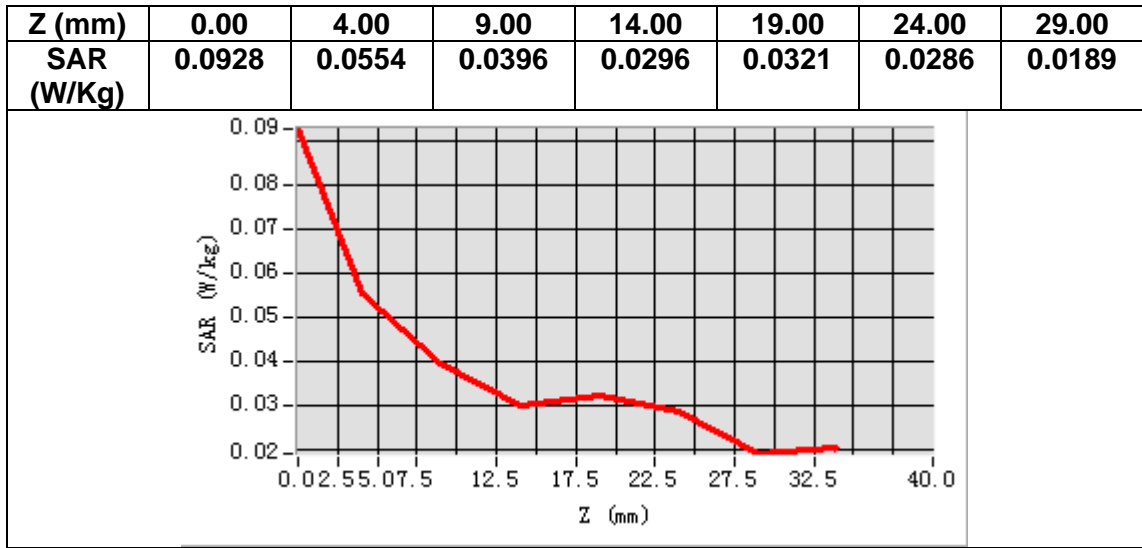
B. SAR Measurement Results

Frequency (MHz)	1732.500000
Relative permittivity (real part)	40.182598
Relative permittivity (imaginary part)	13.638450
Conductivity (S/m)	1.312701
Variation (%)	0.350000



Maximum location: X=-52.00, Y=-6.00
SAR Peak: 0.09 W/kg

SAR 10g (W/Kg)	0.040045
SAR 1g (W/Kg)	0.057322



MEASUREMENT 20

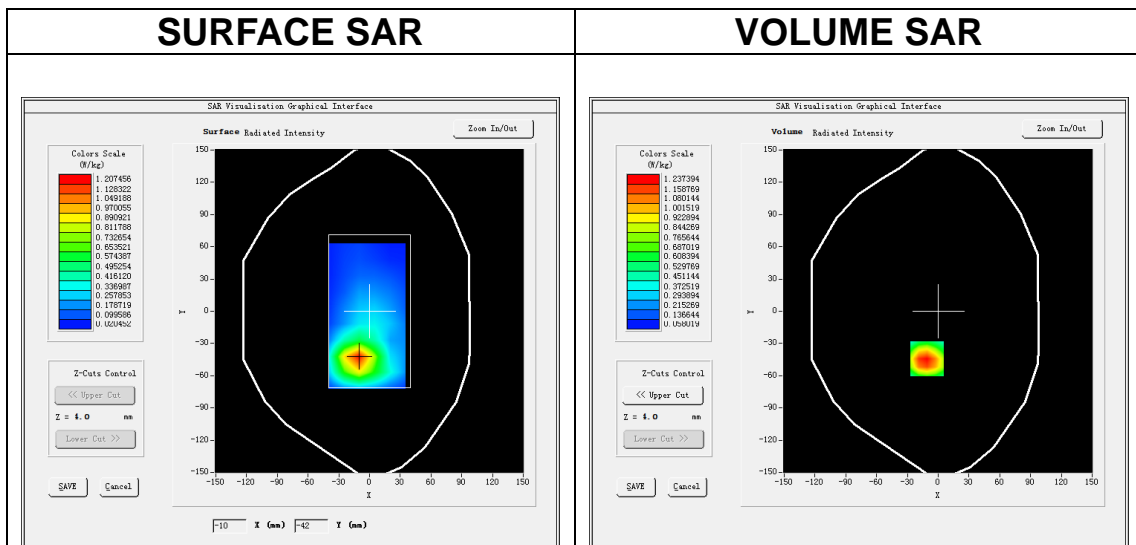
Date of measurement: 6/12/2023

A. Experimental conditions.

Area Scan	<u>dx=15mm dy=15mm, h= 5.00 mm</u>
ZoomScan	<u>5x5x7, dx=8mm dy=8mm dz=5mm</u>
Phantom	<u>Validation plane</u>
Device Position	<u>Body</u>
Band	<u>LTE band 4</u>
Channels	<u>Low</u>
Signal	<u>LTE (Crest factor: 1.0)</u>
ConvF	<u>2.45</u>

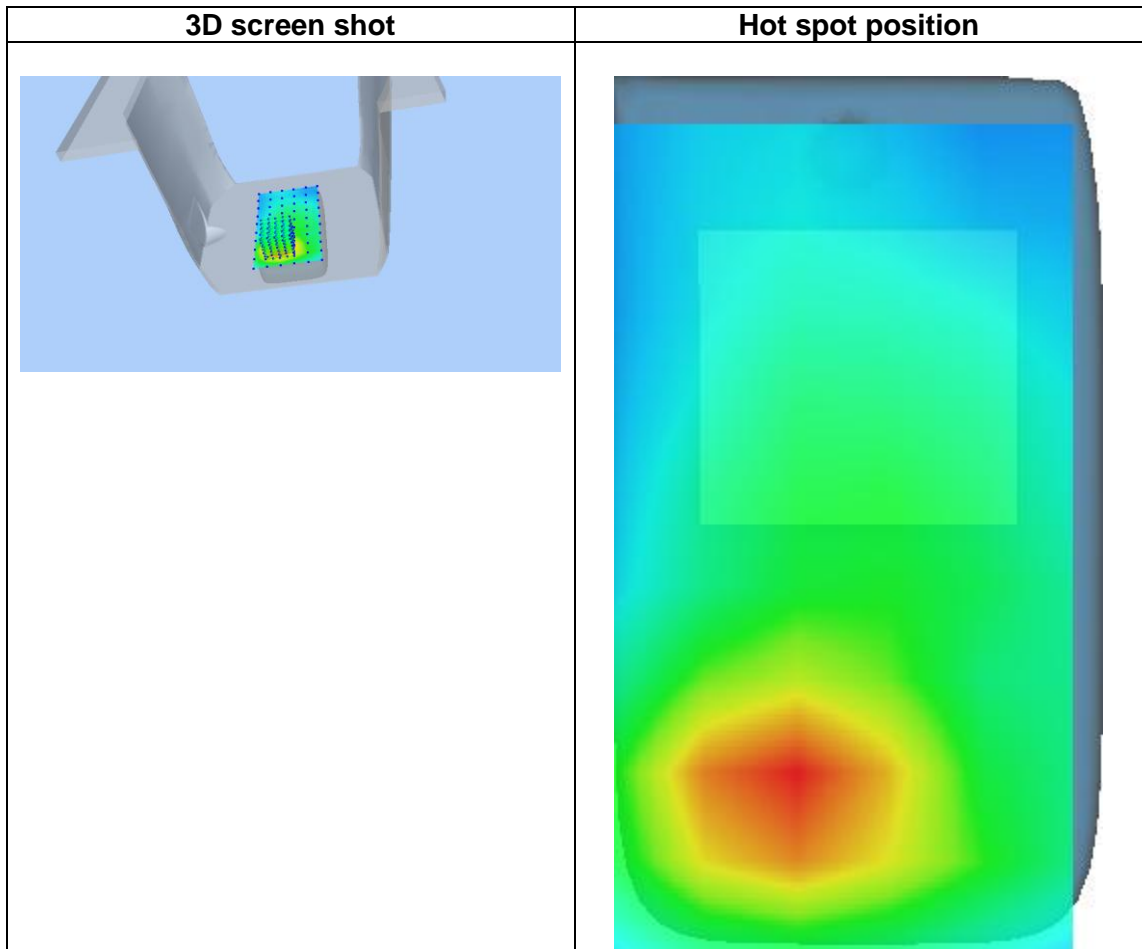
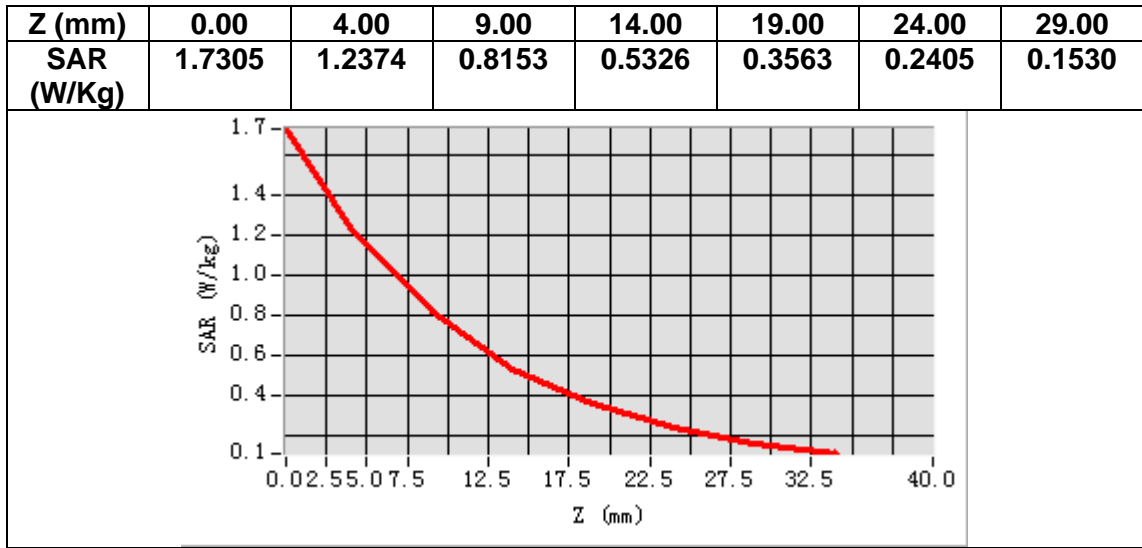
B. SAR Measurement Results

Frequency (MHz)	1720.000000
Relative permittivity (real part)	40.229629
Relative permittivity (imaginary part)	13.854071
Conductivity (S/m)	1.323833
Variation (%)	-0.890000



Maximum location: X=-11.00, Y=-44.00
SAR Peak: 1.80 W/kg

SAR 10g (W/Kg)	0.697169
SAR 1g (W/Kg)	1.196934



MEASUREMENT 21

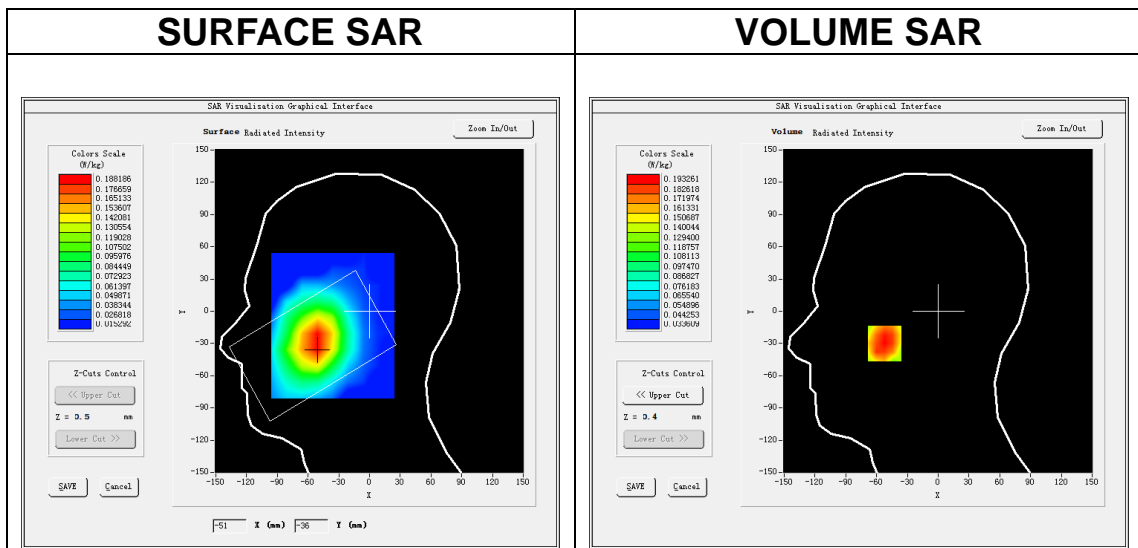
Date of measurement: 24/11/2023

A. Experimental conditions.

Area Scan	<u>dx=15mm dy=15mm, h= 5.00 mm</u>
ZoomScan	<u>5x5x7, dx=8mm dy=8mm dz=5mm</u>
Phantom	<u>Left head</u>
Device Position	<u>Cheek</u>
Band	<u>LTE band 5</u>
Channels	<u>Middle</u>
Signal	<u>LTE (Crest factor: 1.0)</u>
ConvF	<u>2.32</u>

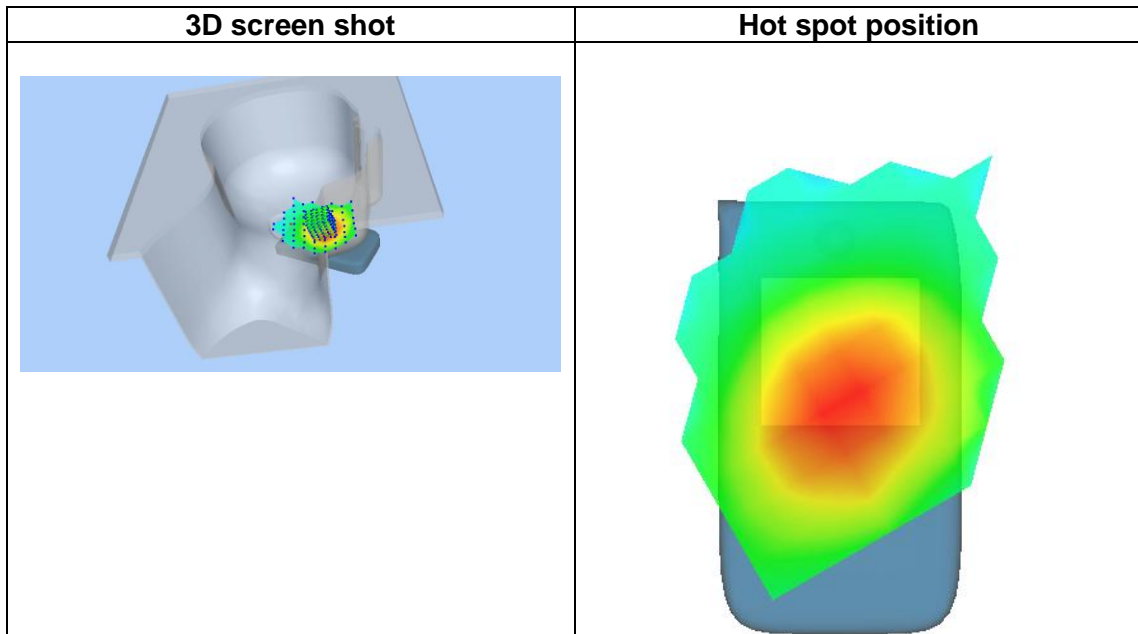
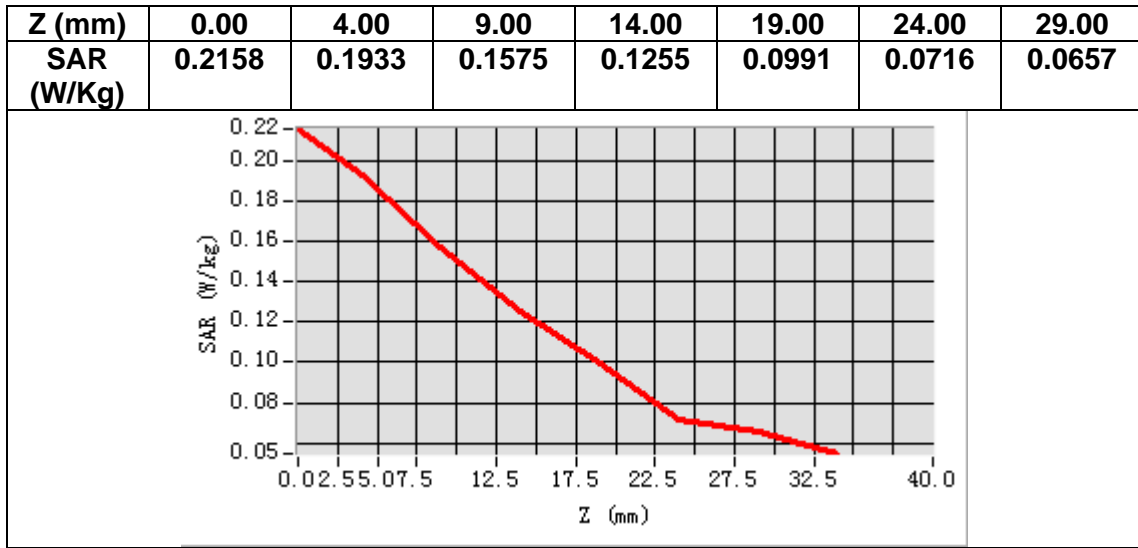
B. SAR Measurement Results

Frequency (MHz)	836.500000
Relative permittivity (real part)	41.565029
Relative permittivity (imaginary part)	19.442995
Conductivity (S/m)	0.903559
Variation (%)	-3.120000



Maximum location: X=-52.00, Y=-30.00
SAR Peak: 0.24 W/kg

SAR 10g (W/Kg)	0.139287
SAR 1g (W/Kg)	0.185308



MEASUREMENT 22

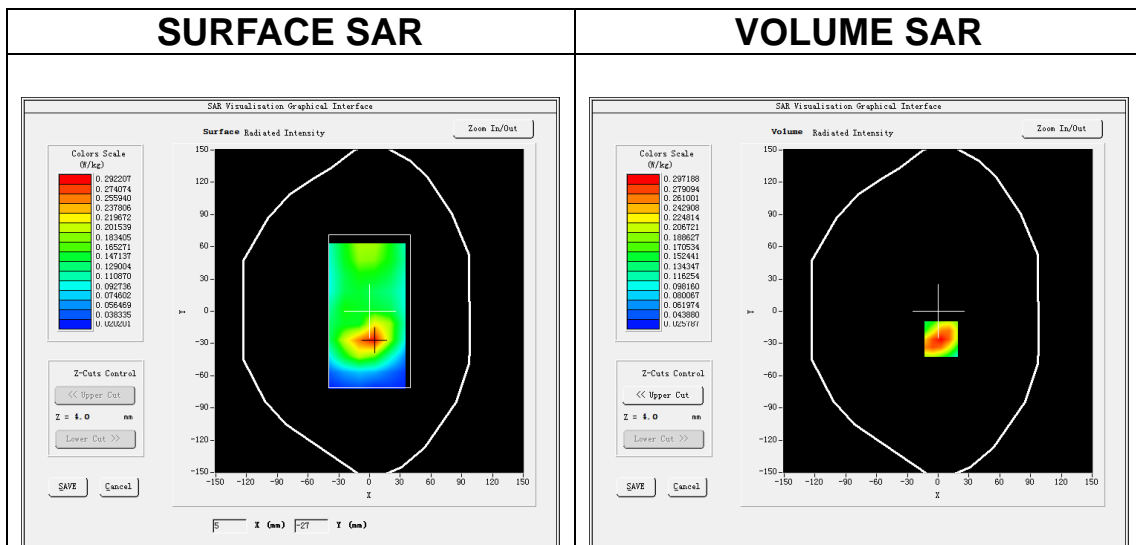
Date of measurement: 24/11/2023

A. Experimental conditions.

Area Scan	<u>dx=15mm dy=15mm, h= 5.00 mm</u>
ZoomScan	<u>5x5x7, dx=8mm dy=8mm dz=5mm</u>
Phantom	<u>Validation plane</u>
Device Position	<u>Body</u>
Band	<u>LTE band 5</u>
Channels	<u>Middle</u>
Signal	<u>LTE (Crest factor: 1.0)</u>
ConvF	<u>2.32</u>

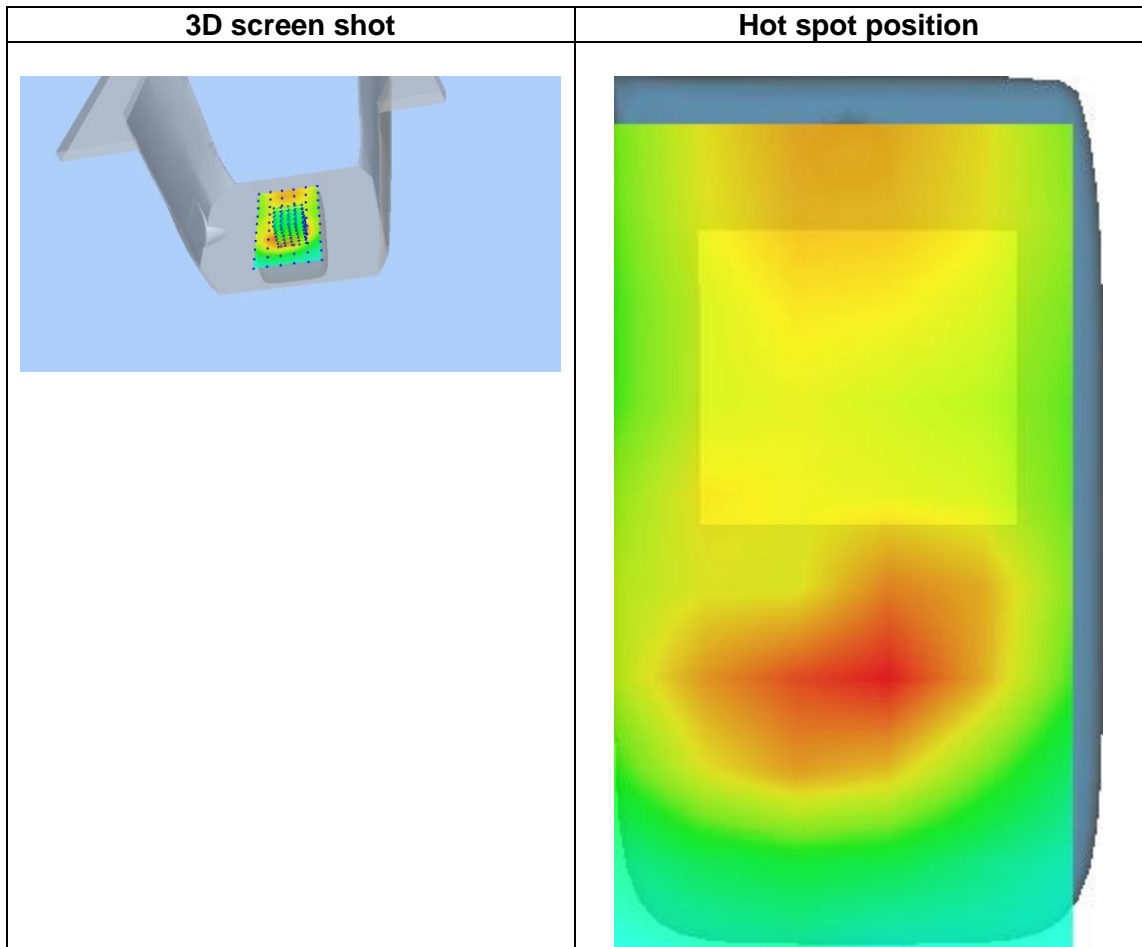
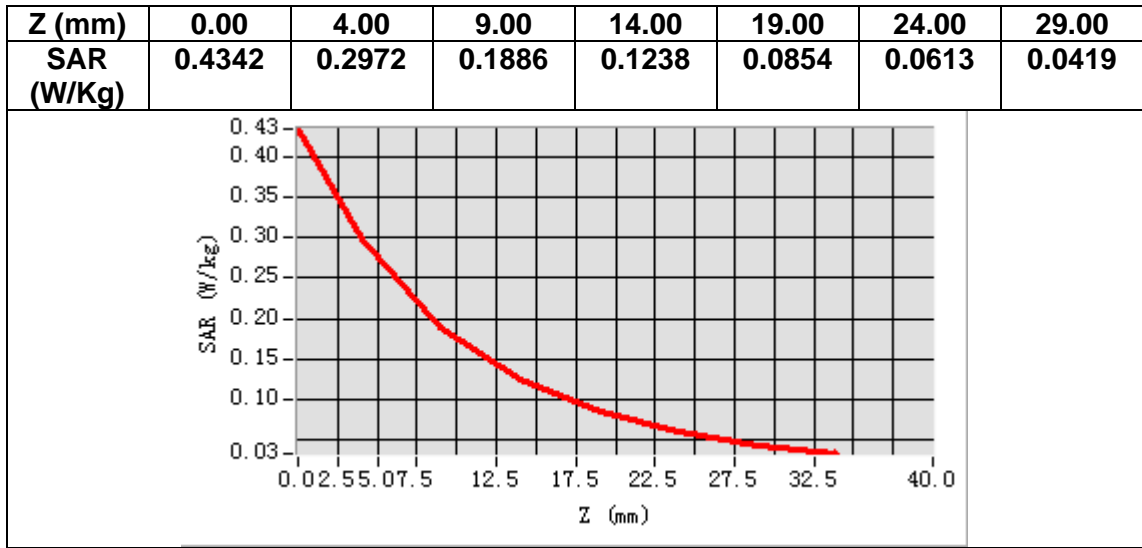
B. SAR Measurement Results

Frequency (MHz)	836.500000
Relative permittivity (real part)	41.565029
Relative permittivity (imaginary part)	19.442995
Conductivity (S/m)	0.903559
Variation (%)	1.470000



Maximum location: X=3.00, Y=-26.00
SAR Peak: 0.44 W/kg

SAR 10g (W/Kg)	0.173654
SAR 1g (W/Kg)	0.285243



MEASUREMENT 23

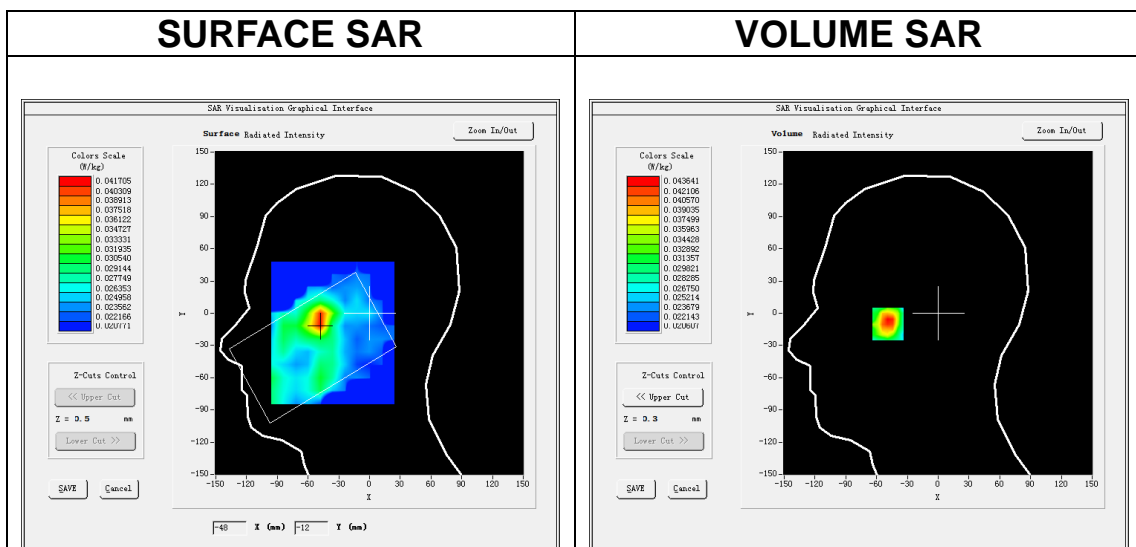
Date of measurement: 22/11/2023

A. Experimental conditions.

Area Scan	<u>dx=12mm dy=12mm, h= 5.00 mm</u>
ZoomScan	<u>7x7x7,dx=5mm dy=5mm dz=5mm</u>
Phantom	<u>Left head</u>
Device Position	<u>Cheek</u>
Band	<u>LTE band 7</u>
Channels	<u>Middle</u>
Signal	<u>LTE (Crest factor: 1.0)</u>
ConvF	<u>2.65</u>

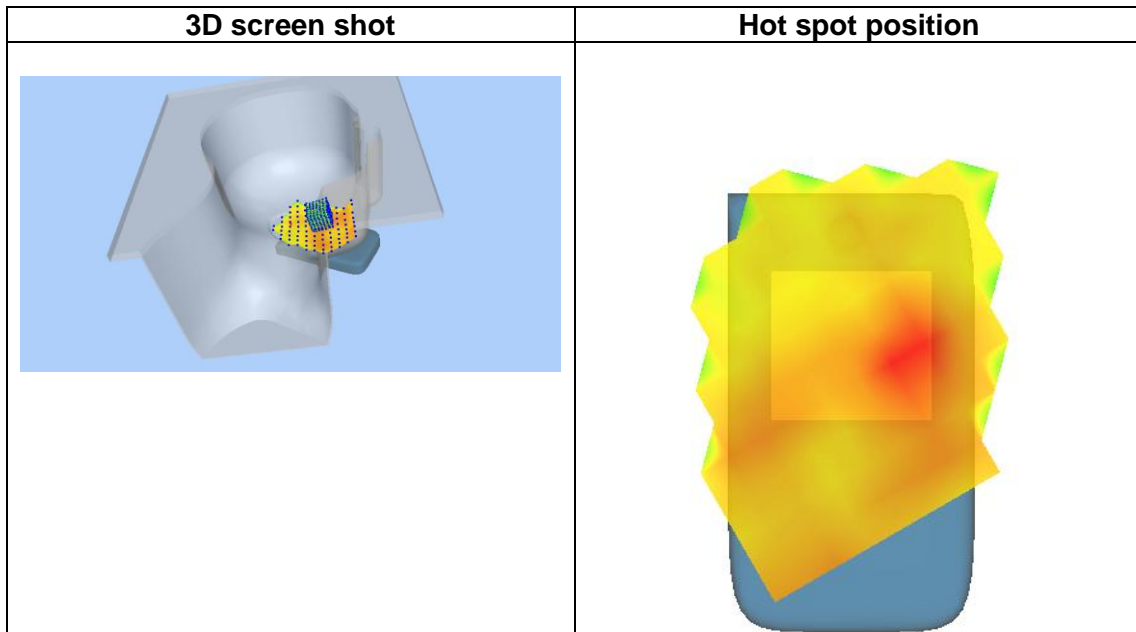
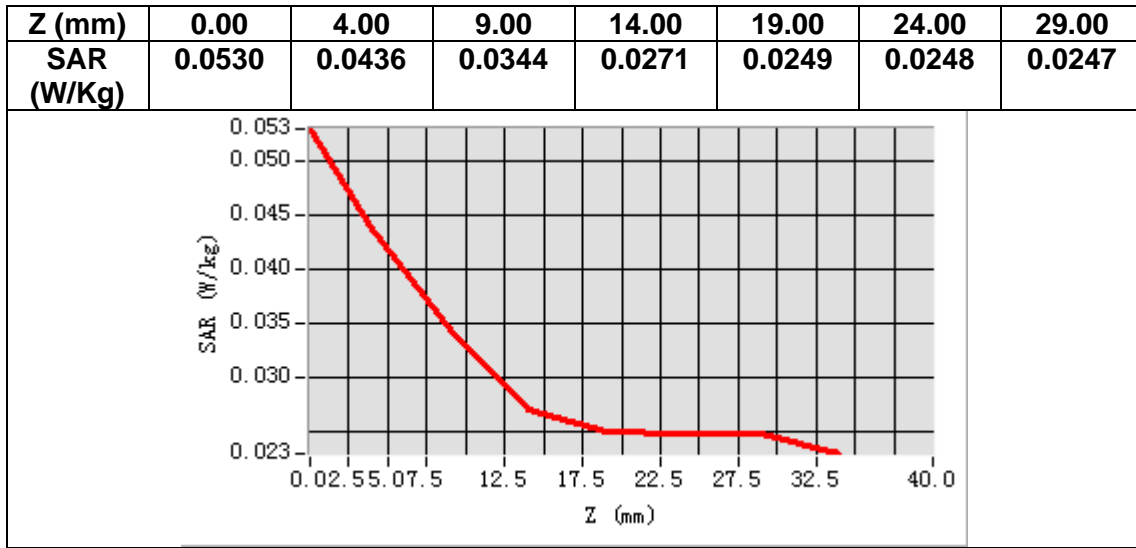
B. SAR Measurement Results

Frequency (MHz)	2535.000000
Relative permittivity (real part)	38.811852
Relative permittivity (imaginary part)	13.088056
Conductivity (S/m)	1.843235
Variation (%)	0.810000



Maximum location: X=-49.00, Y=-9.00
SAR Peak: 0.05 W/kg

SAR 10g (W/Kg)	0.031103
SAR 1g (W/Kg)	0.040294



MEASUREMENT 24

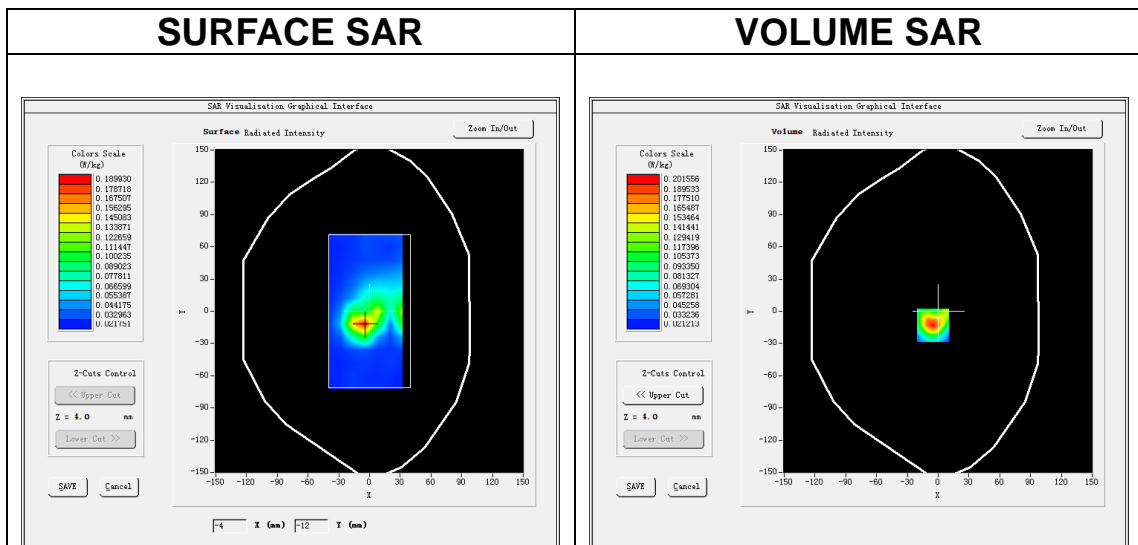
Date of measurement: 22/11/2023

A. Experimental conditions.

Area Scan	<u>dx=12mm dy=12mm, h= 5.00 mm</u>
ZoomScan	<u>7x7x7,dx=5mm dy=5mm dz=5mm</u>
Phantom	<u>Validation plane</u>
Device Position	<u>Body</u>
Band	<u>LTE band 7</u>
Channels	<u>Middle</u>
Signal	<u>LTE (Crest factor: 1.0)</u>
ConvF	<u>2.65</u>

B. SAR Measurement Results

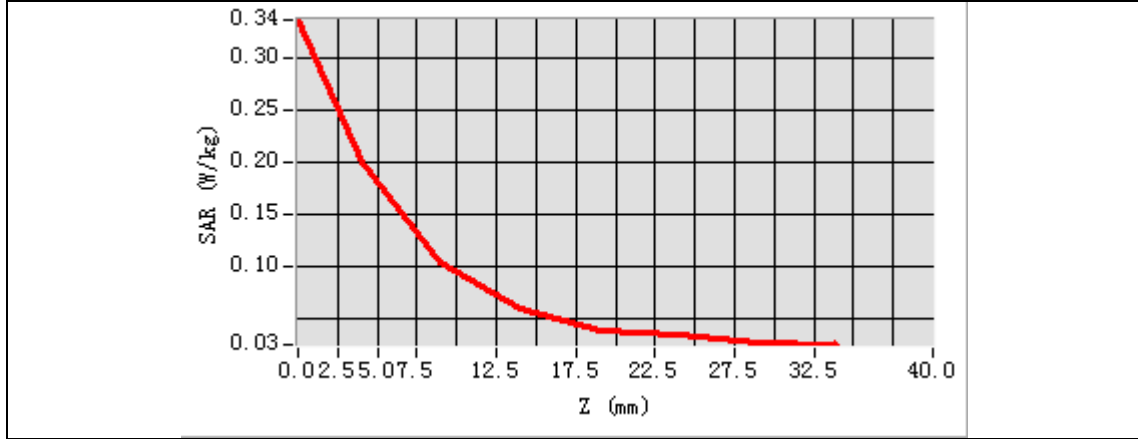
Frequency (MHz)	2535.000000
Relative permittivity (real part)	38.811852
Relative permittivity (imaginary part)	13.088056
Conductivity (S/m)	1.843235
Variation (%)	-3.780000

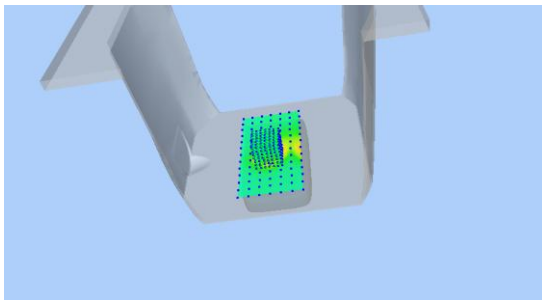
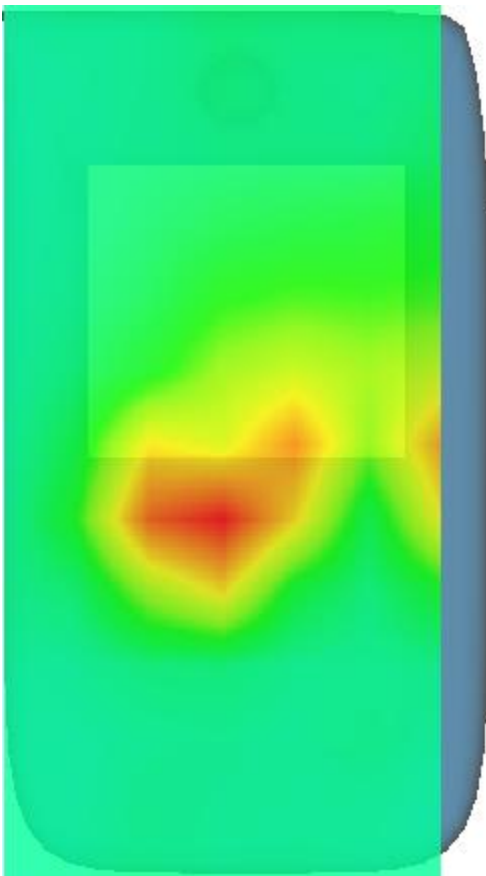


Maximum location: X=-5.00, Y=-13.00
SAR Peak: 0.33 W/kg

SAR 10g (W/Kg)	0.094190
SAR 1g (W/Kg)	0.184511

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.3374	0.2016	0.1040	0.0613	0.0394	0.0345	0.0279



3D screen shot	Hot spot position
	

MEASUREMENT 25

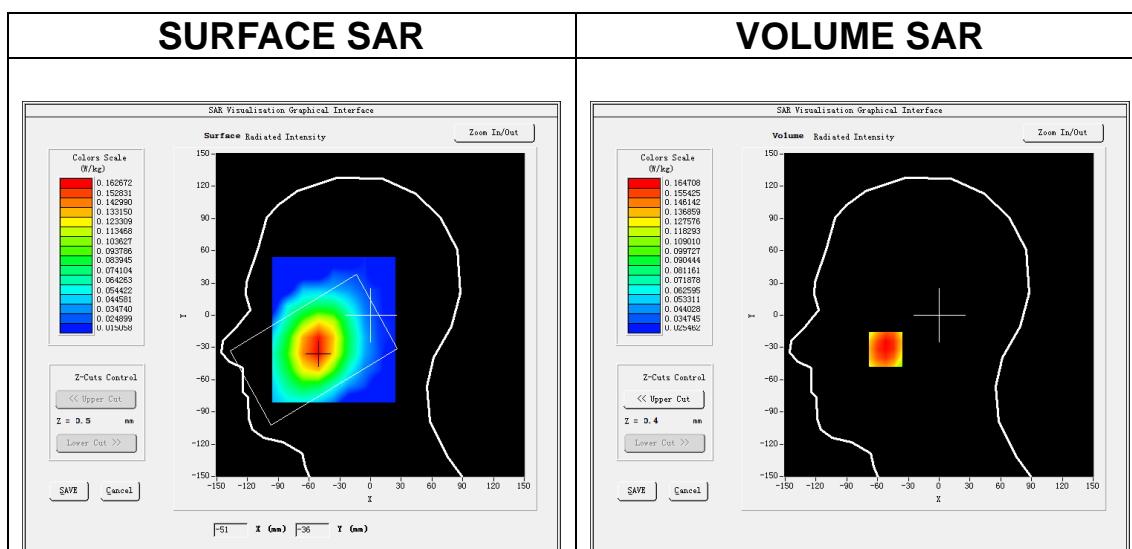
Date of measurement: 5/12/2023

A. Experimental conditions.

Area Scan	<u>dx=15mm dy=15mm, h= 5.00 mm</u>
ZoomScan	<u>5x5x7, dx=8mm dy=8mm dz=5mm</u>
Phantom	<u>Left head</u>
Device Position	<u>Cheek</u>
Band	<u>LTE band 12</u>
Channels	<u>Middle</u>
Signal	<u>LTE (Crest factor: 1.0)</u>
ConvF	<u>2.37</u>

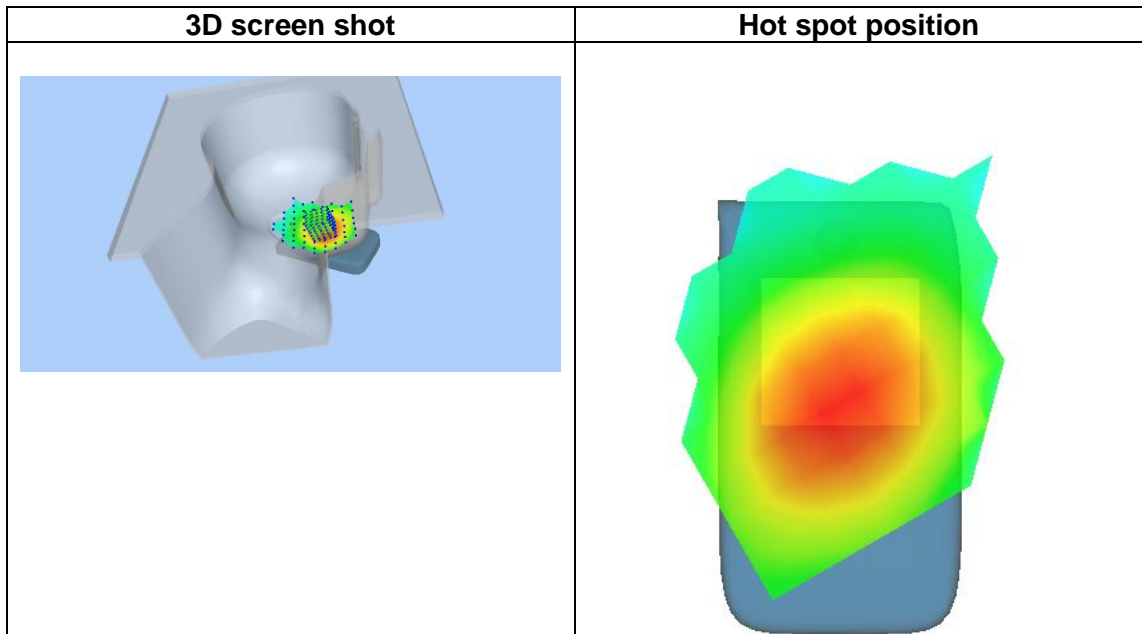
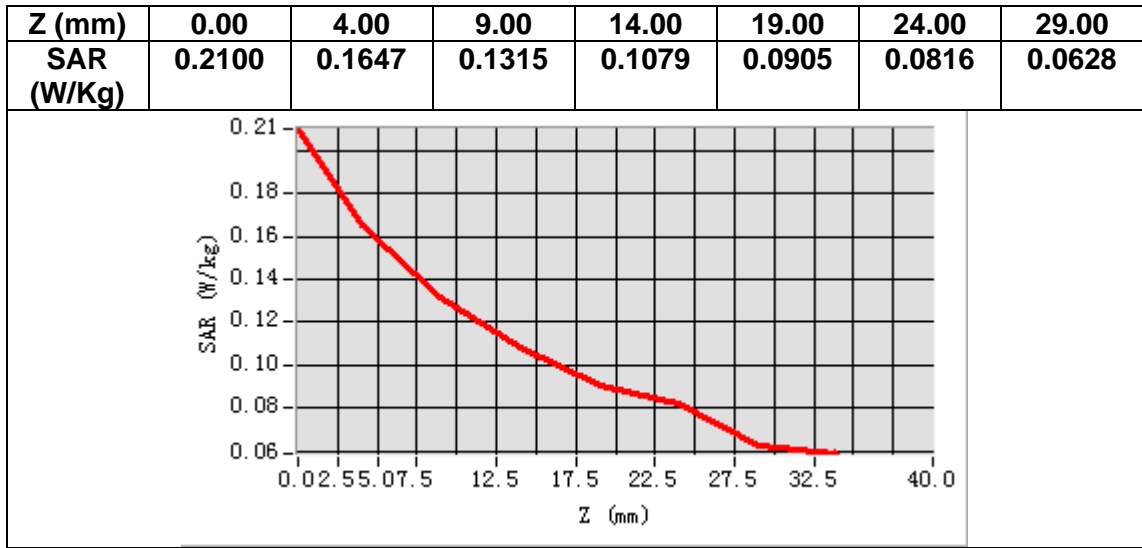
B. SAR Measurement Results

Frequency (MHz)	707.500000
Relative permittivity (real part)	42.544853
Relative permittivity (imaginary part)	21.803511
Conductivity (S/m)	0.856999
Variation (%)	-0.990000



Maximum location: X=-52.00, Y=-32.00
SAR Peak: 0.21 W/kg

SAR 10g (W/Kg)	0.125071
SAR 1g (W/Kg)	0.162358



MEASUREMENT 26

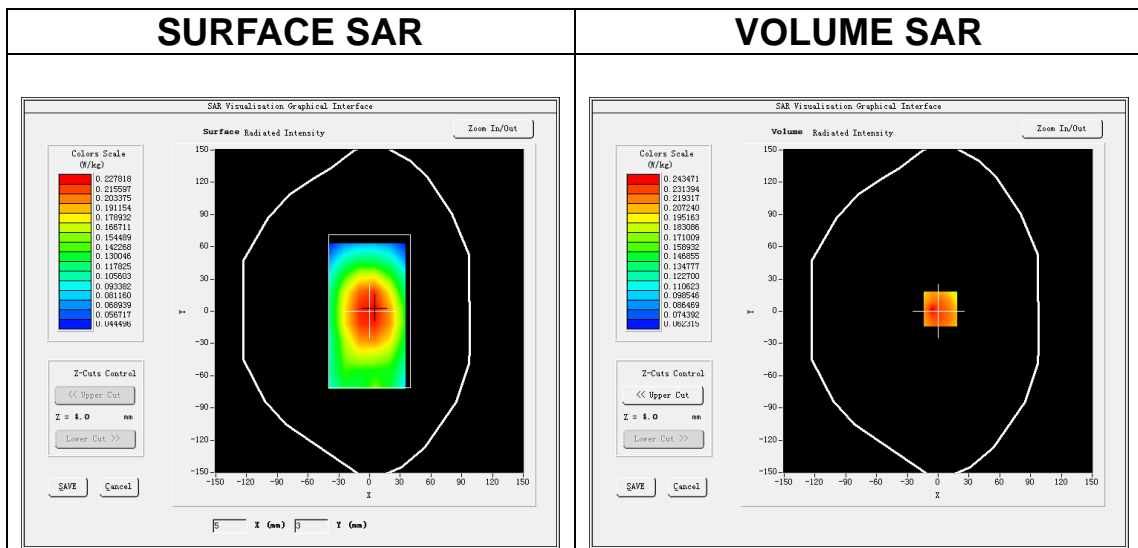
Date of measurement: 5/12/2023

A. Experimental conditions.

<u>Area Scan</u>	<u>dx=15mm dy=15mm, h= 5.00 mm</u>
<u>ZoomScan</u>	<u>5x5x7, dx=8mm dy=8mm dz=5mm</u>
<u>Phantom</u>	<u>Validation plane</u>
<u>Device Position</u>	<u>Body</u>
<u>Band</u>	<u>LTE band 12</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>LTE (Crest factor: 1.0)</u>
<u>ConvF</u>	<u>2.37</u>

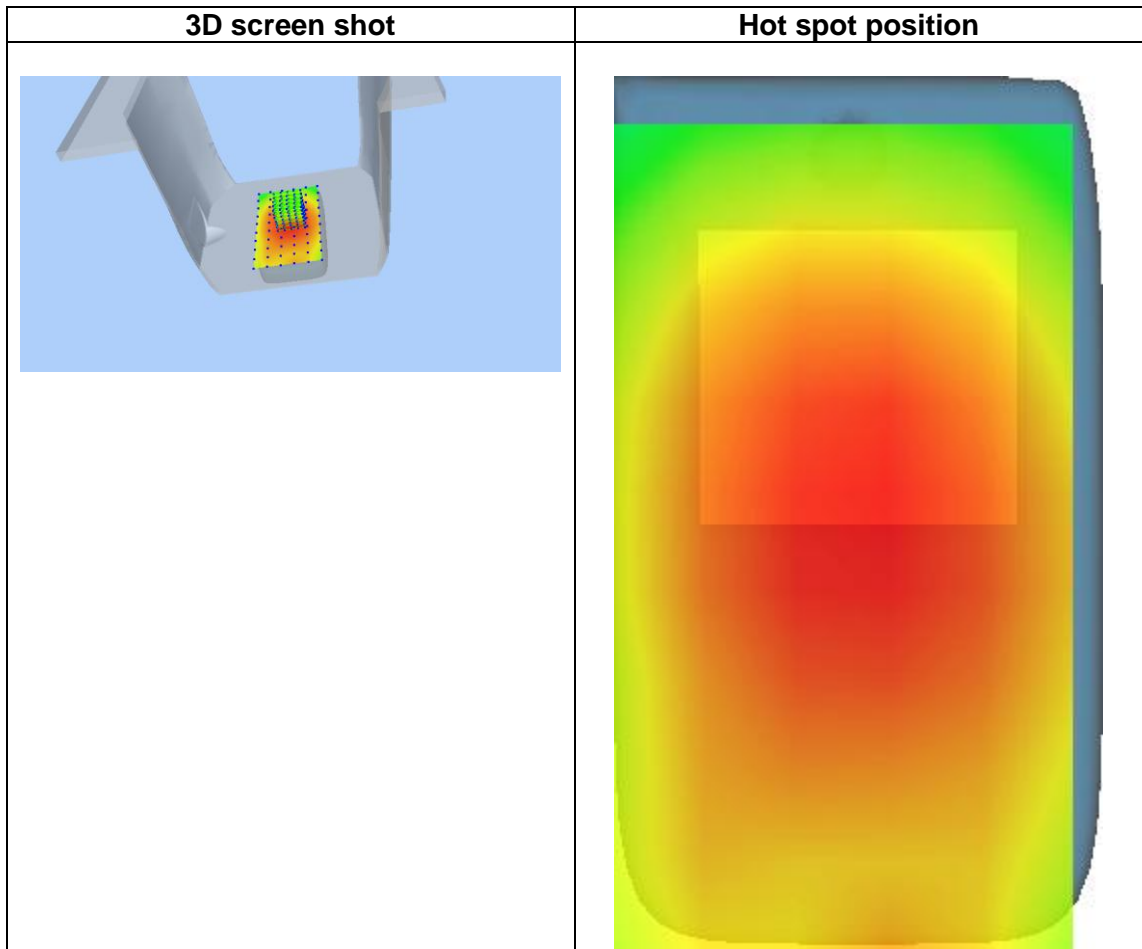
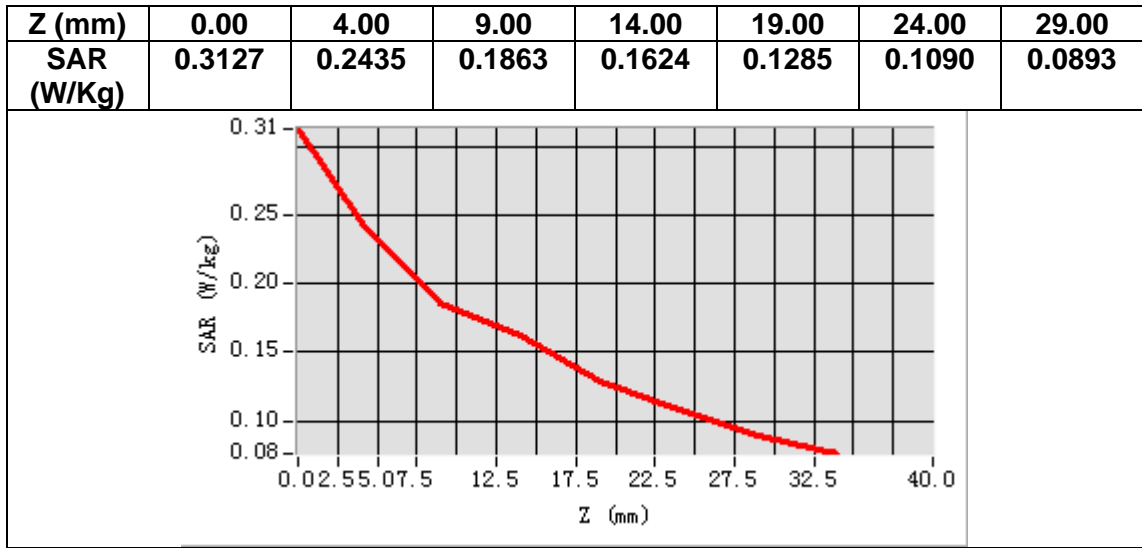
B. SAR Measurement Results

Frequency (MHz)	707.500000
Relative permittivity (real part)	42.544853
Relative permittivity (imaginary part)	21.803511
Conductivity (S/m)	0.856999
Variation (%)	-0.660000



Maximum location: X=2.00, Y=2.00
SAR Peak: 0.31 W/kg

SAR 10g (W/Kg)	0.181583
SAR 1g (W/Kg)	0.233359



MEASUREMENT 27

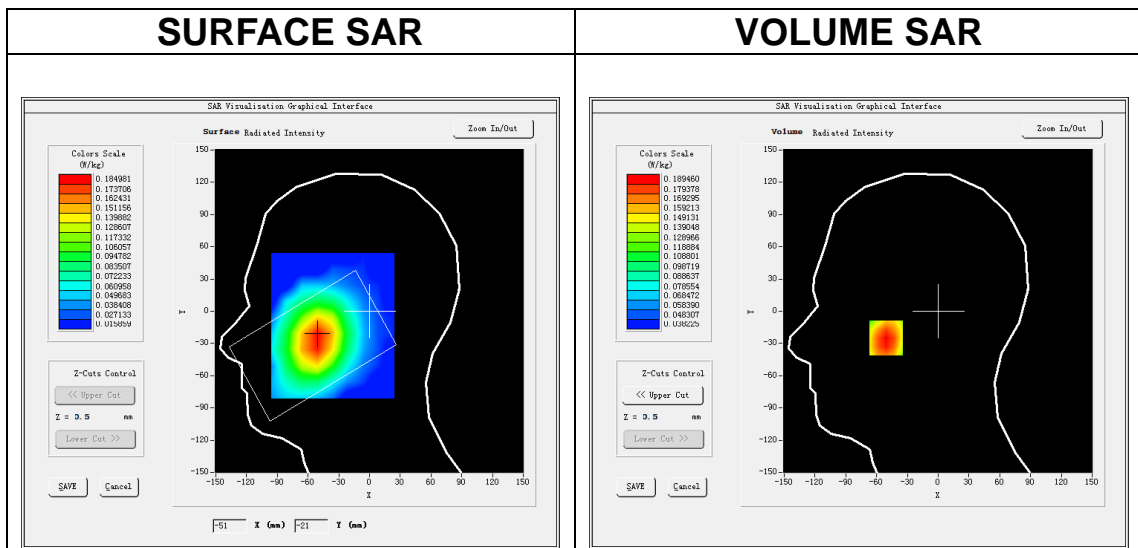
Date of measurement: 5/12/2023

A. Experimental conditions.

Area Scan	<u>dx=15mm dy=15mm, h= 5.00 mm</u>
ZoomScan	<u>5x5x7, dx=8mm dy=8mm dz=5mm</u>
Phantom	<u>Left head</u>
Device Position	<u>Cheek</u>
Band	<u>LTE band 13</u>
Channels	<u>Middle</u>
Signal	<u>LTE (Crest factor: 1.0)</u>
ConvF	<u>2.37</u>

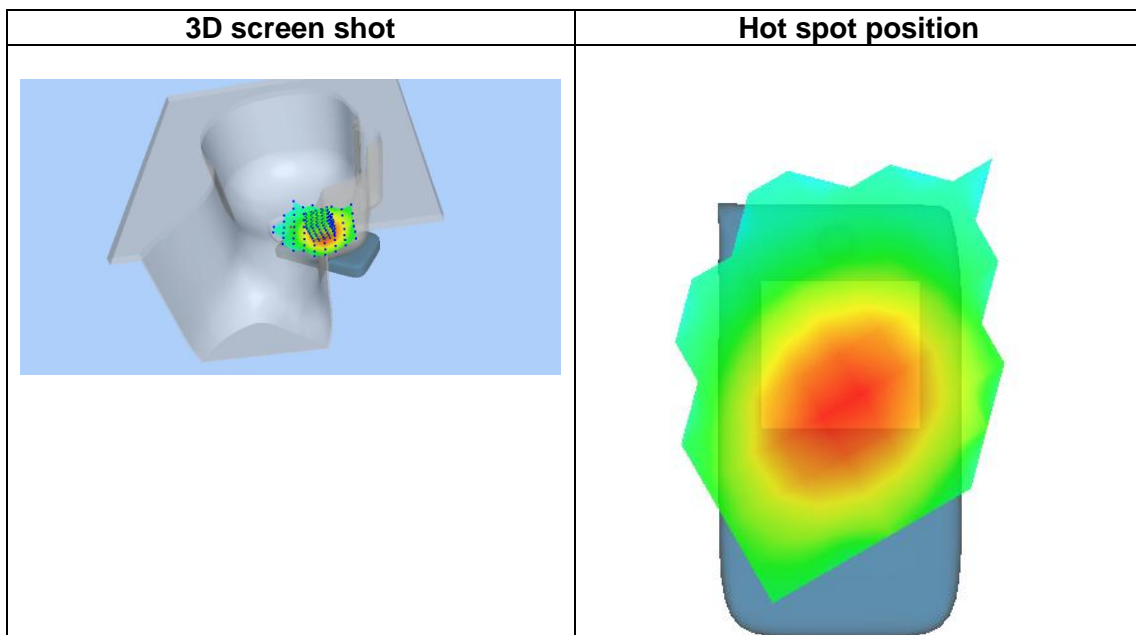
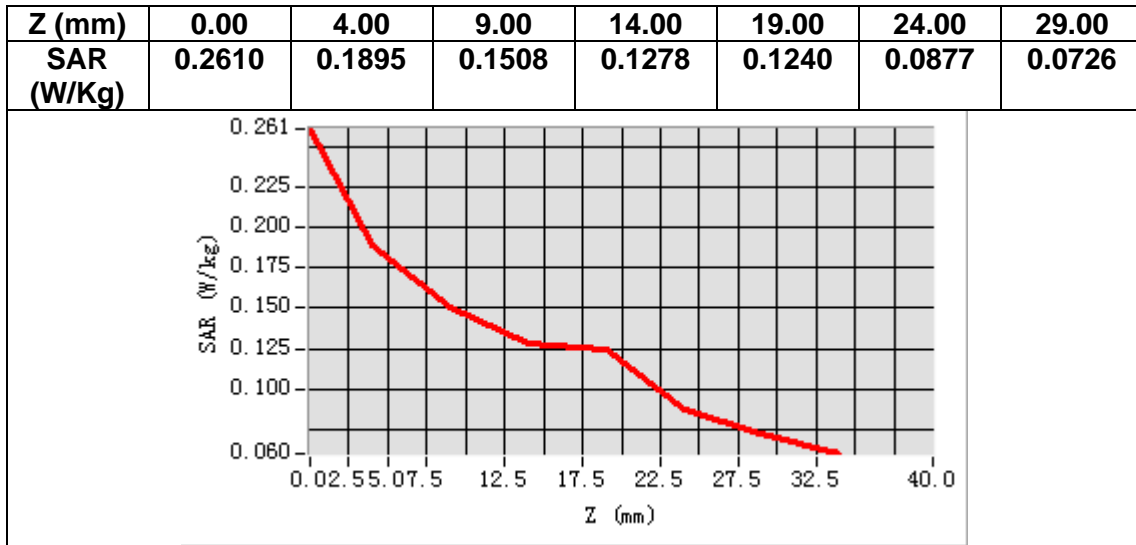
B. SAR Measurement Results

Frequency (MHz)	782.000000
Relative permittivity (real part)	41.586805
Relative permittivity (imaginary part)	21.160711
Conductivity (S/m)	0.919315
Variation (%)	-2.220000



Maximum location: X=-51.00, Y=-25.00
SAR Peak: 0.28 W/kg

SAR 10g (W/Kg)	0.144981
SAR 1g (W/Kg)	0.198018



MEASUREMENT 28

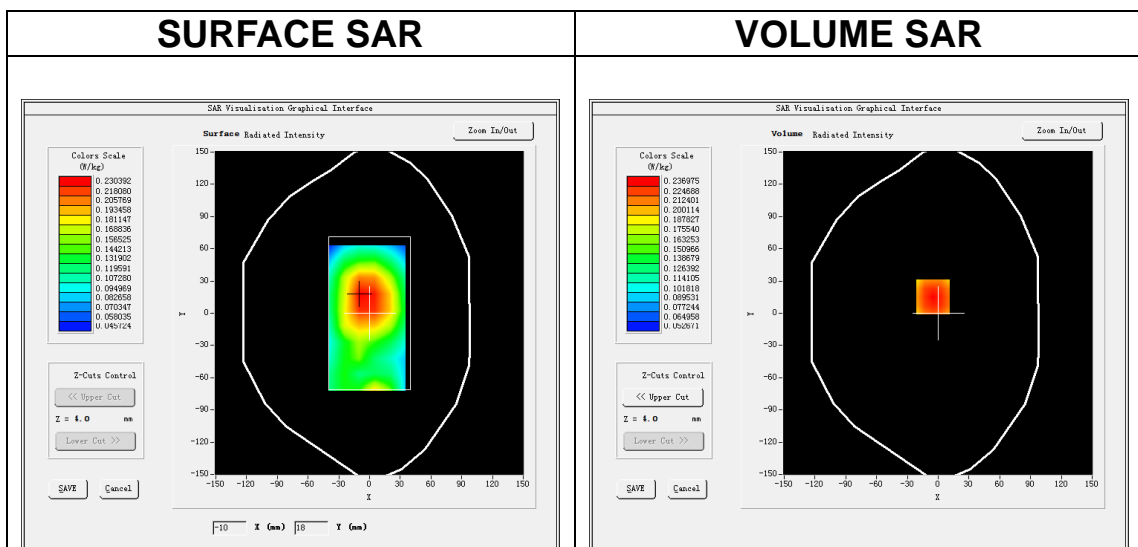
Date of measurement: 5/12/2023

A. Experimental conditions.

Area Scan	<u>dx=15mm dy=15mm, h= 5.00 mm</u>
ZoomScan	<u>5x5x7, dx=8mm dy=8mm dz=5mm</u>
Phantom	<u>Validation plane</u>
Device Position	<u>Body</u>
Band	<u>LTE band 13</u>
Channels	<u>Middle</u>
Signal	<u>LTE (Crest factor: 1.0)</u>
ConvF	<u>2.37</u>

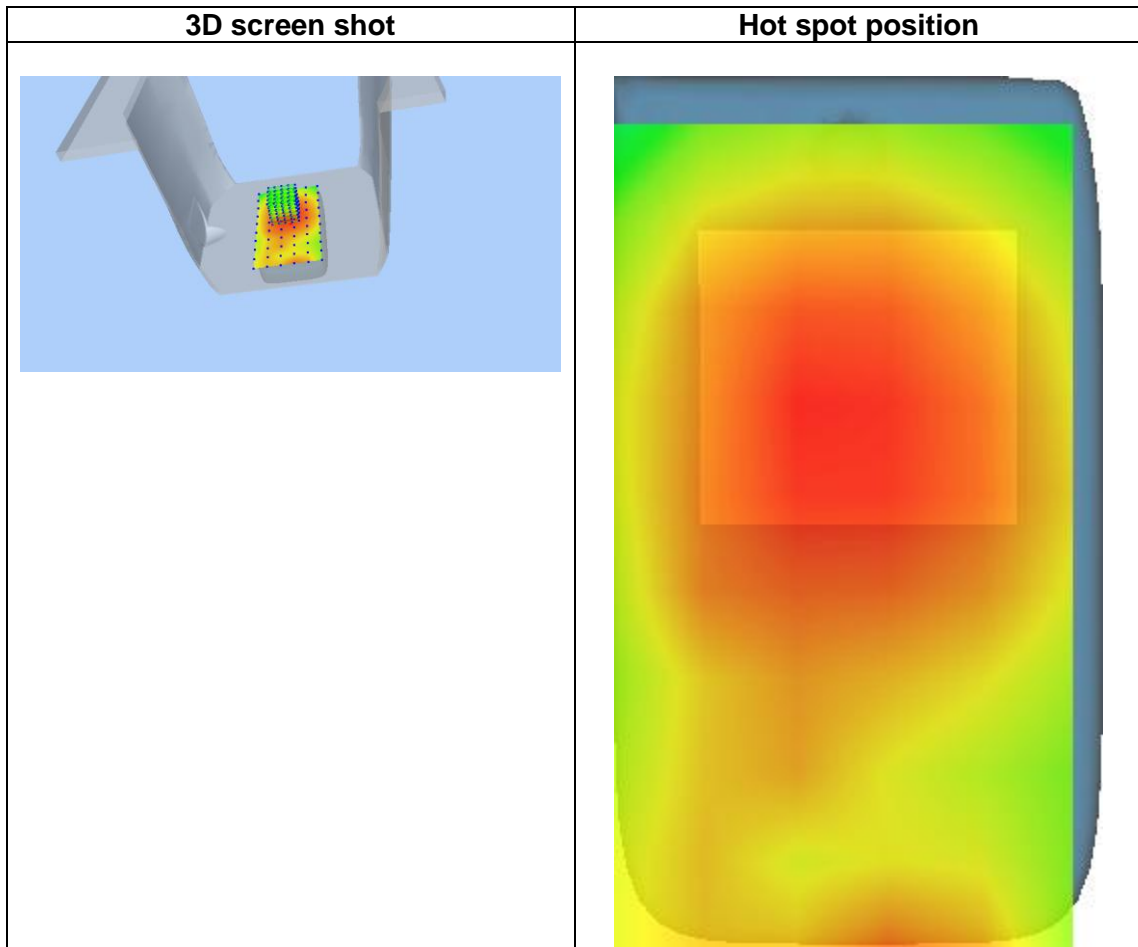
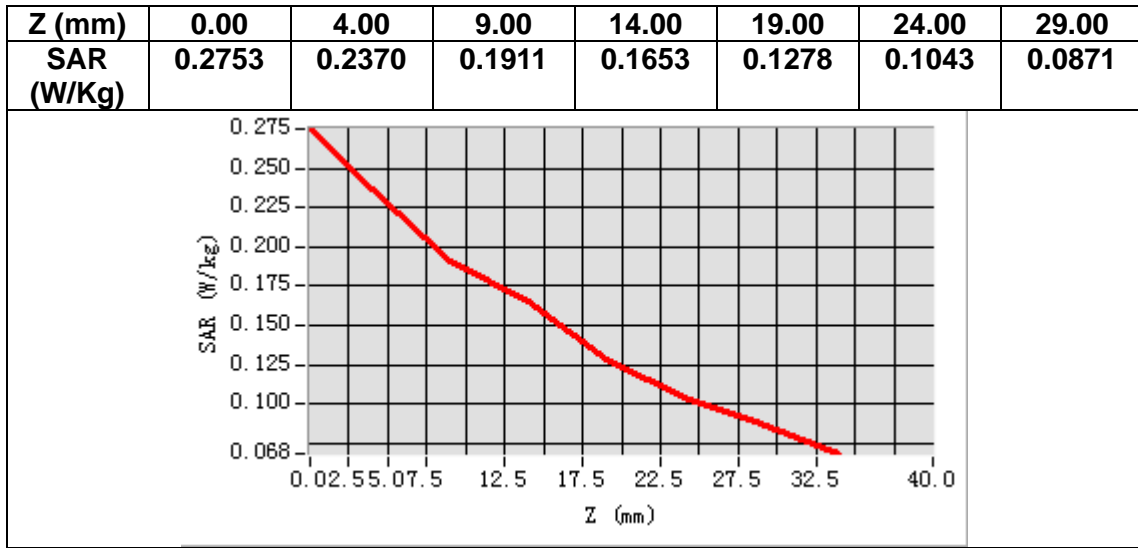
B. SAR Measurement Results

Frequency (MHz)	782.000000
Relative permittivity (real part)	41.586805
Relative permittivity (imaginary part)	21.160711
Conductivity (S/m)	0.919315
Variation (%)	0.820000



Maximum location: X=-5.00, Y=15.00
SAR Peak: 0.29 W/kg

SAR 10g (W/Kg)	0.181322
SAR 1g (W/Kg)	0.234946



MEASUREMENT 29

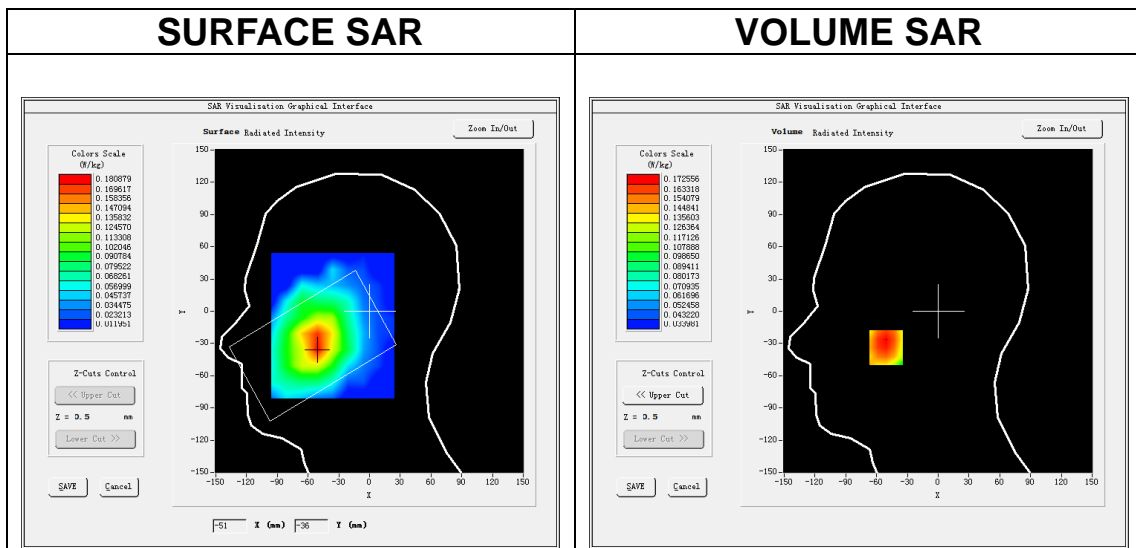
Date of measurement: 5/12/2023

A. Experimental conditions.

Area Scan	<u>dx=15mm dy=15mm, h= 5.00 mm</u>
ZoomScan	<u>5x5x7, dx=8mm dy=8mm dz=5mm</u>
Phantom	<u>Left head</u>
Device Position	<u>Cheek</u>
Band	<u>LTE band 17</u>
Channels	<u>Middle</u>
Signal	<u>LTE (Crest factor: 1.0)</u>
ConvF	<u>2.37</u>

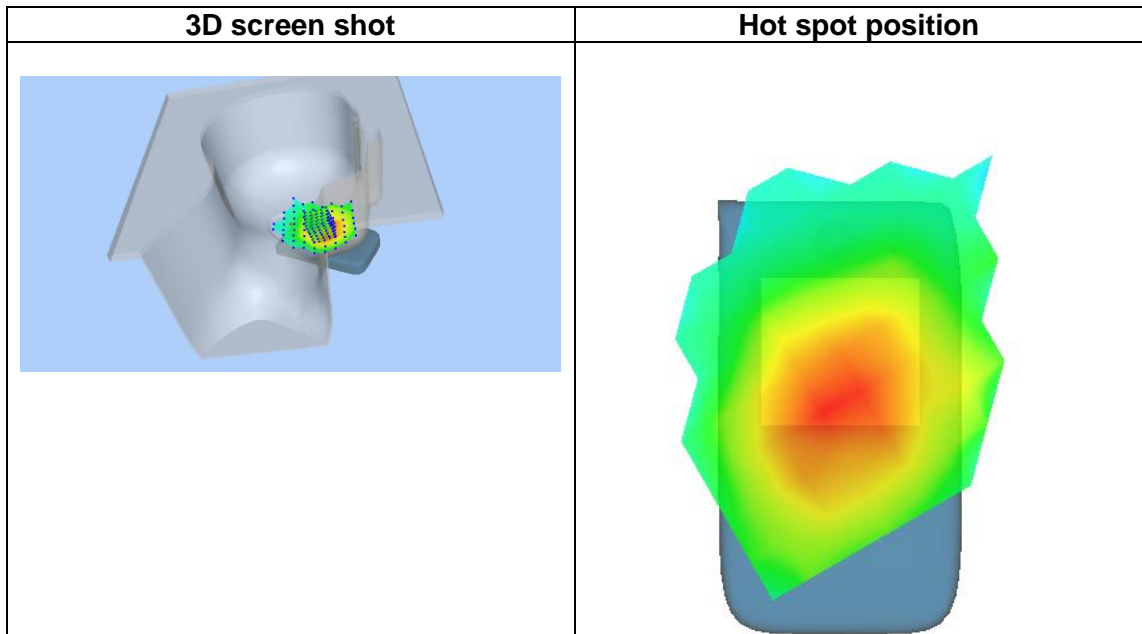
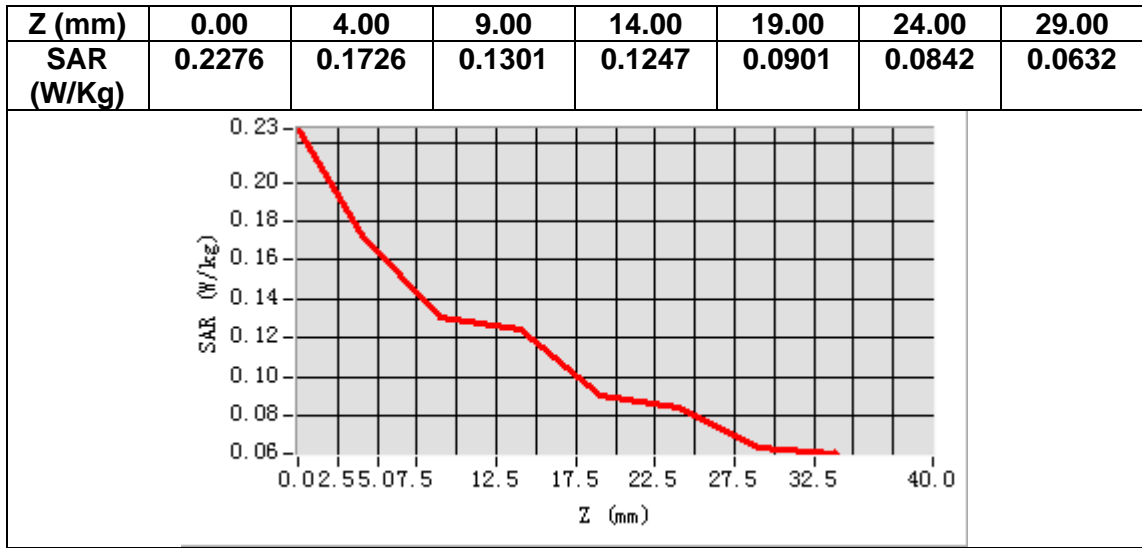
B. SAR Measurement Results

Frequency (MHz)	710.000000
Relative permittivity (real part)	42.523605
Relative permittivity (imaginary part)	21.831911
Conductivity (S/m)	0.861148
Variation (%)	2.110000



Maximum location: X=-51.00, Y=-34.00
SAR Peak: 0.22 W/kg

SAR 10g (W/Kg)	0.133045
SAR 1g (W/Kg)	0.171088



MEASUREMENT 30

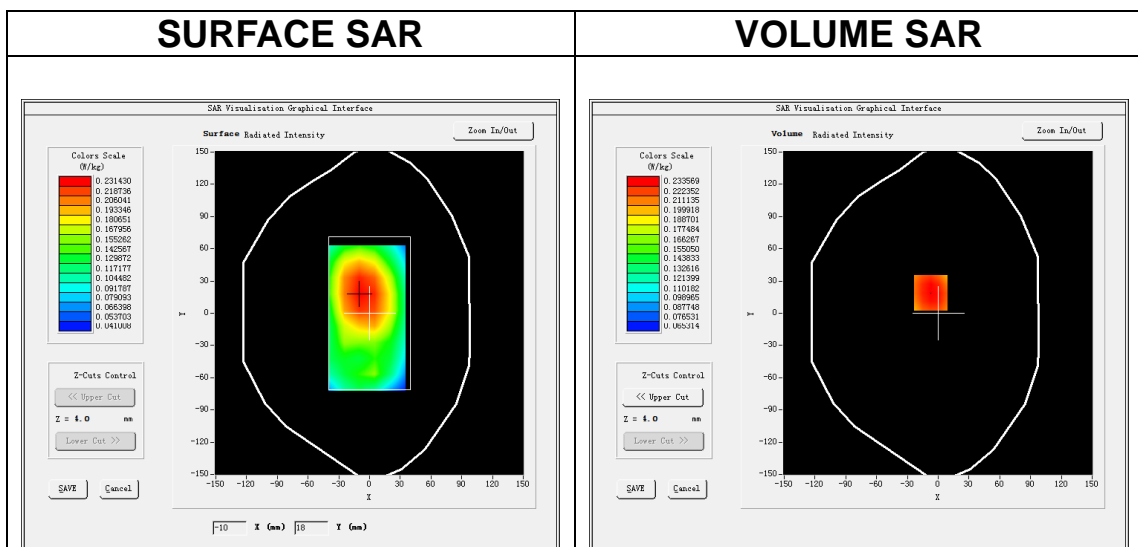
Date of measurement: 5/12/2023

A. Experimental conditions.

Area Scan	<u>dx=15mm dy=15mm, h= 5.00 mm</u>
ZoomScan	<u>5x5x7, dx=8mm dy=8mm dz=5mm</u>
Phantom	<u>Validation plane</u>
Device Position	<u>Body</u>
Band	<u>LTE band 17</u>
Channels	<u>Middle</u>
Signal	<u>LTE (Crest factor: 1.0)</u>
ConvF	<u>2.37</u>

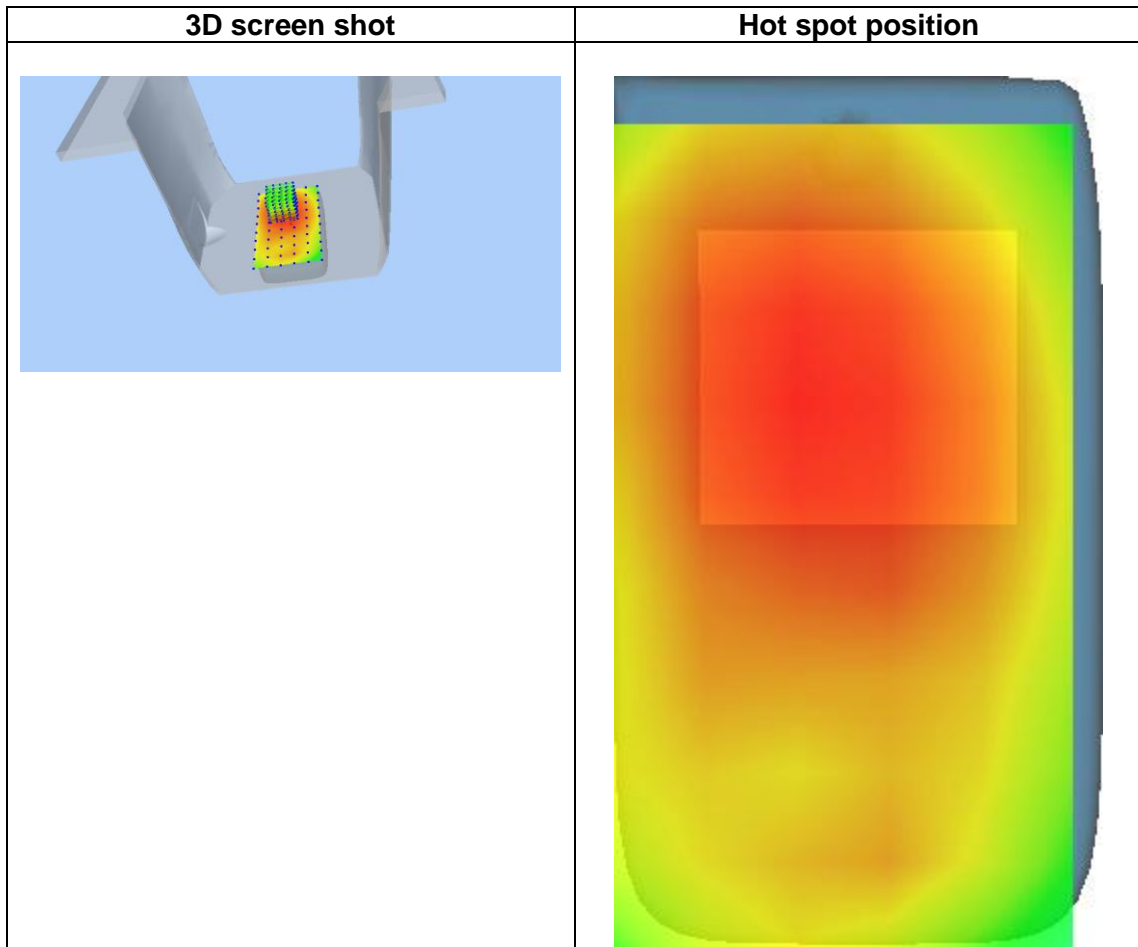
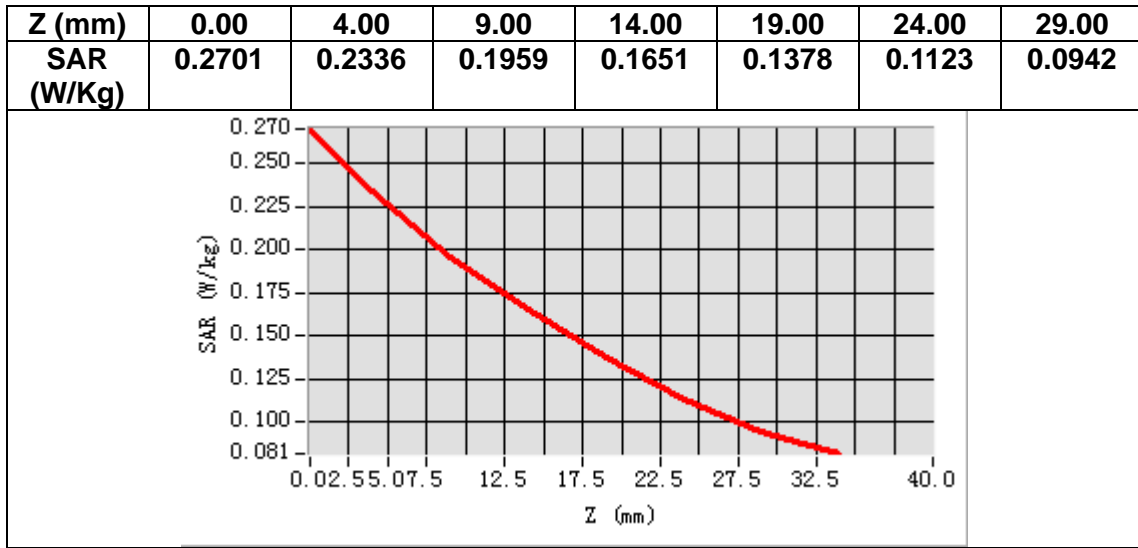
B. SAR Measurement Results

Frequency (MHz)	710.000000
Relative permittivity (real part)	42.523605
Relative permittivity (imaginary part)	21.831911
Conductivity (S/m)	0.861148
Variation (%)	1.060000



Maximum location: X=-7.00, Y=19.00
SAR Peak: 0.27 W/kg

SAR 10g (W/Kg)	0.183993
SAR 1g (W/Kg)	0.229283



MEASUREMENT 31

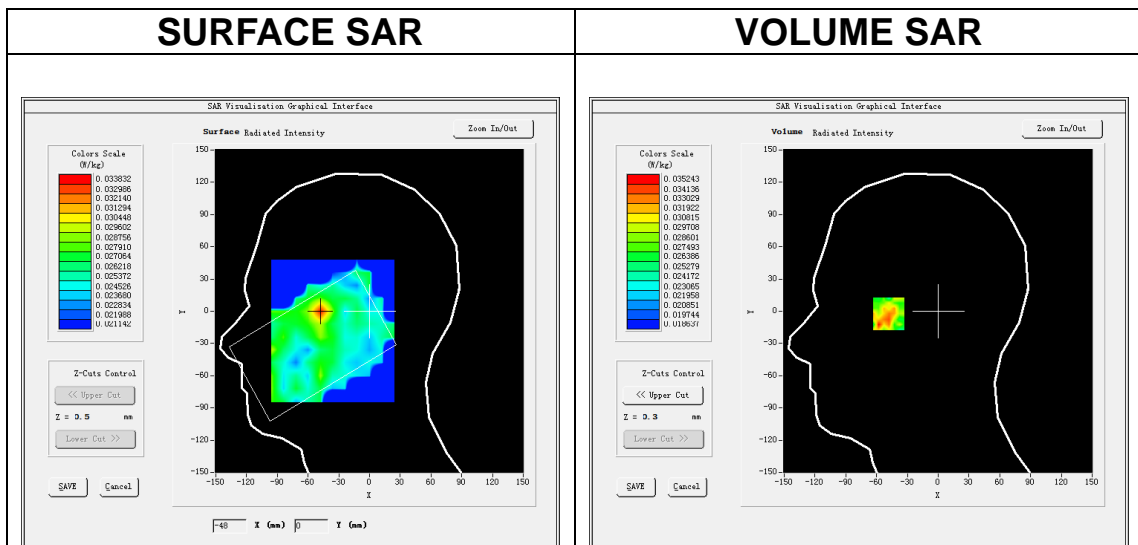
Date of measurement: 22/11/2023

A. Experimental conditions.

<u>Area Scan</u>	<u>dx=12mm dy=12mm, h= 5.00 mm</u>
<u>ZoomScan</u>	<u>7x7x7,dx=5mm dy=5mm dz=5mm</u>
<u>Phantom</u>	<u>Left head</u>
<u>Device Position</u>	<u>Cheek</u>
<u>Band</u>	<u>LTE band 41</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>LTE (Crest factor: 1.0)</u>
<u>ConvF</u>	<u>2.65</u>

B. SAR Measurement Results

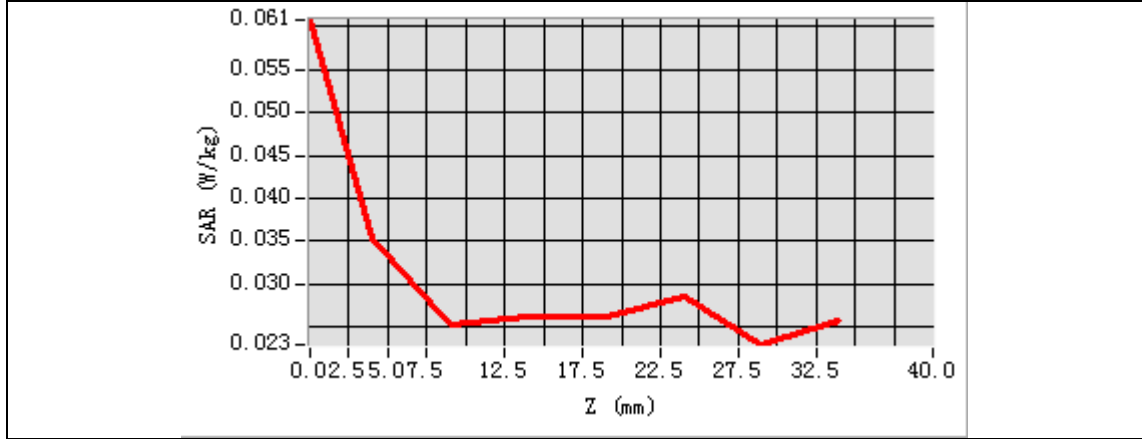
Frequency (MHz)	2595.000000
Relative permittivity (real part)	38.443951
Relative permittivity (imaginary part)	13.301856
Conductivity (S/m)	1.917684
Variation (%)	-2.140000



Maximum location: X=-48.00, Y=0.00
SAR Peak: 0.05 W/kg

SAR 10g (W/Kg)	0.028385
SAR 1g (W/Kg)	0.031890

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.0608	0.0352	0.0253	0.0262	0.0262	0.0284	0.0229



3D screen shot	Hot spot position

MEASUREMENT 32

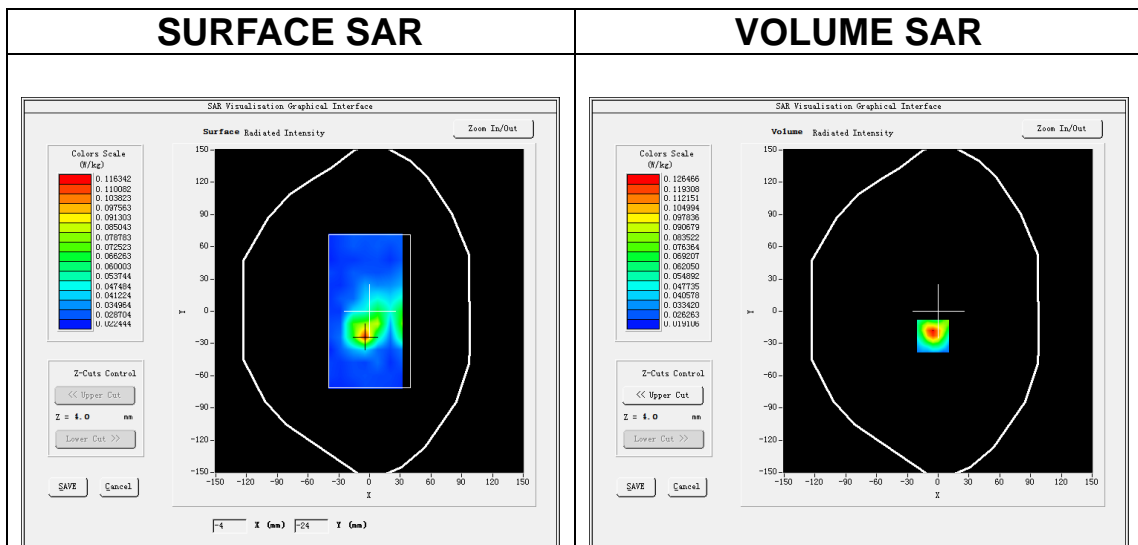
Date of measurement: 22/11/2023

A. Experimental conditions.

Area Scan	<u>dx=12mm dy=12mm, h= 5.00 mm</u>
ZoomScan	<u>7x7x7,dx=5mm dy=5mm dz=5mm</u>
Phantom	<u>Validation plane</u>
Device Position	<u>Body</u>
Band	<u>LTE band 41</u>
Channels	<u>Middle</u>
Signal	<u>LTE (Crest factor: 1.0)</u>
ConvF	<u>2.65</u>

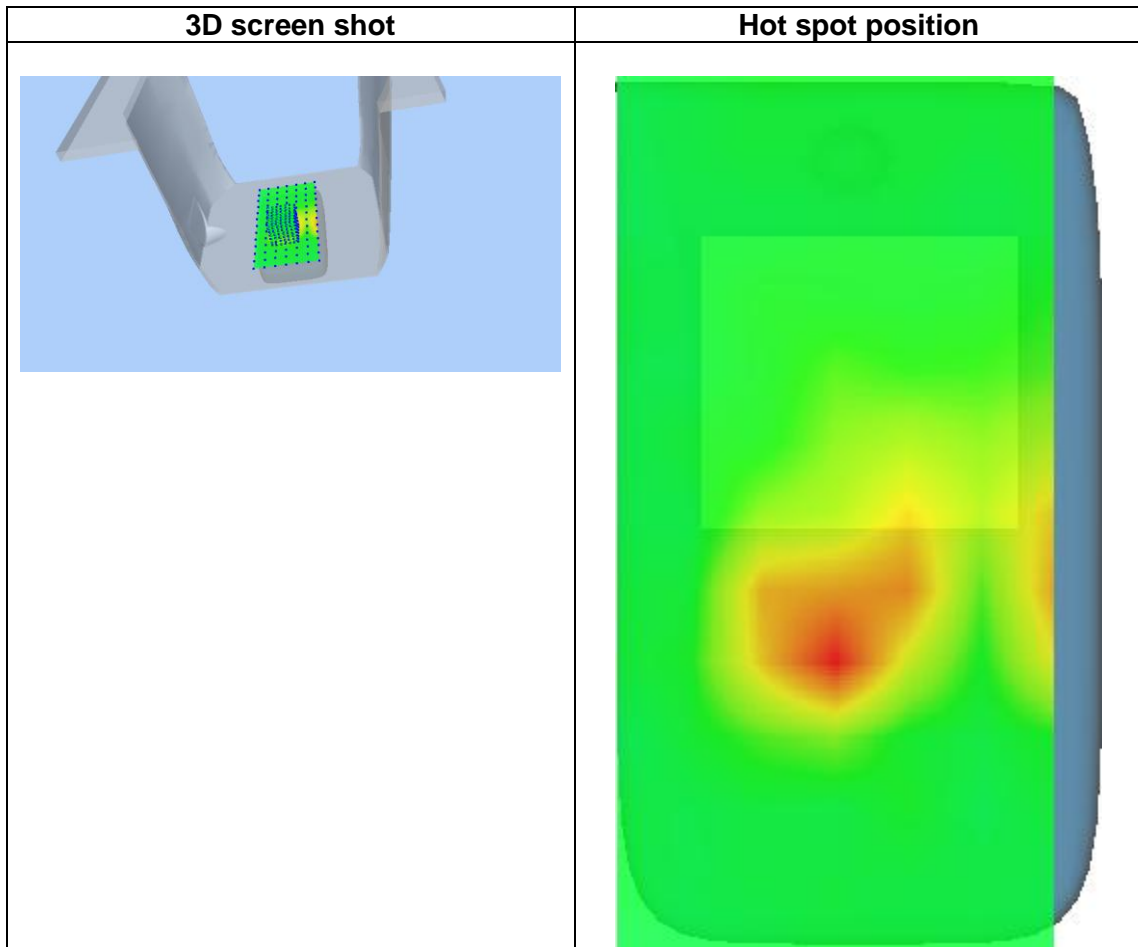
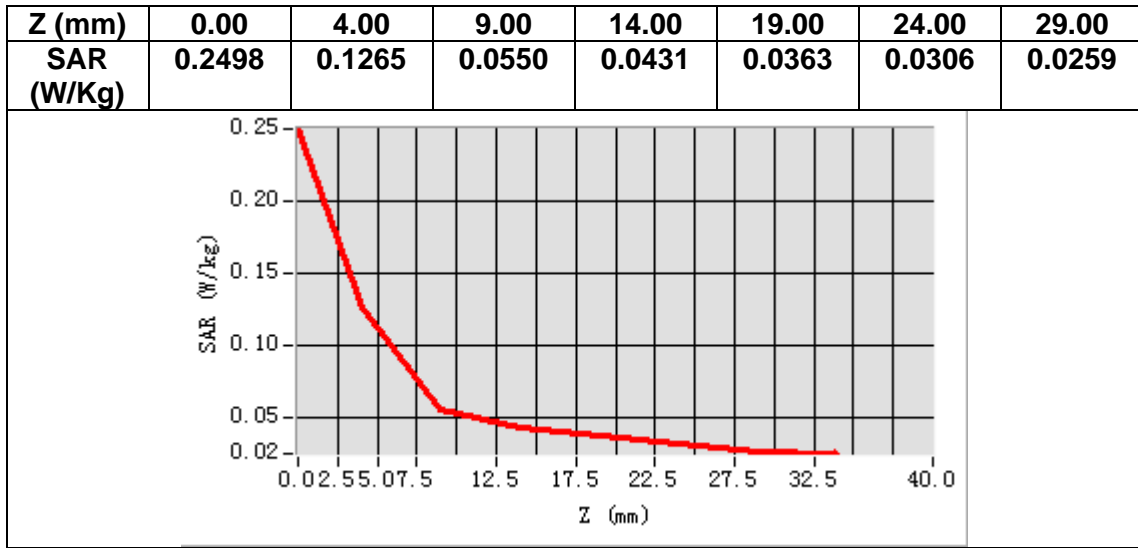
B. SAR Measurement Results

Frequency (MHz)	2595.000000
Relative permittivity (real part)	38.443951
Relative permittivity (imaginary part)	13.301856
Conductivity (S/m)	1.917684
Variation (%)	3.460000



Maximum location: X=-5.00, Y=-23.00
SAR Peak: 0.21 W/kg

SAR 10g (W/Kg)	0.062311
SAR 1g (W/Kg)	0.116358



MEASUREMENT 33

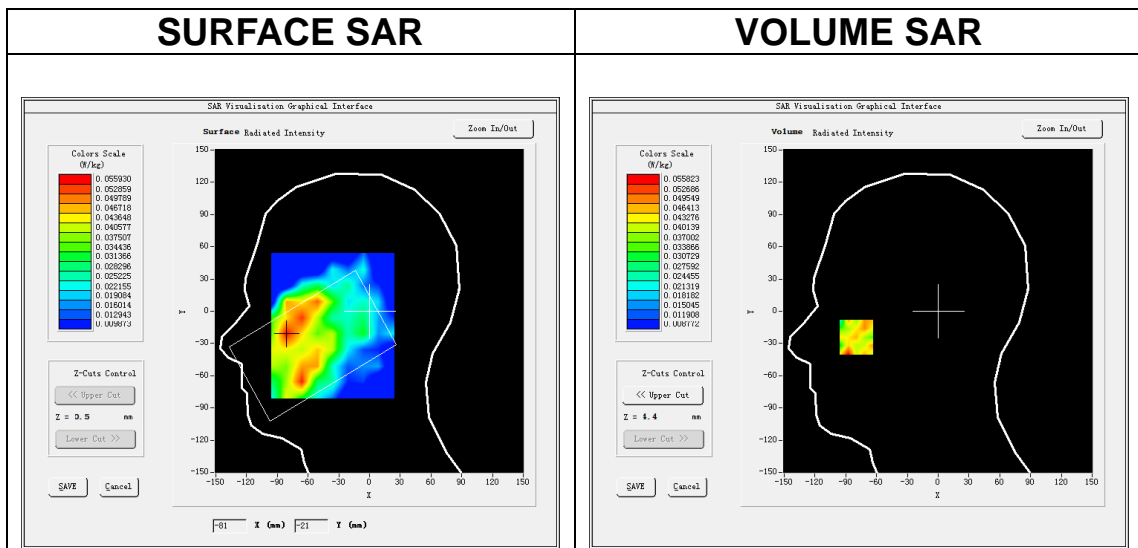
Date of measurement: 6/12/2023

A. Experimental conditions.

<u>Area Scan</u>	<u>dx=15mm dy=15mm, h= 5.00 mm</u>
<u>ZoomScan</u>	<u>5x5x7, dx=8mm dy=8mm dz=5mm</u>
<u>Phantom</u>	<u>Left head</u>
<u>Device Position</u>	<u>Cheek</u>
<u>Band</u>	<u>FDDBand66</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>(Crest factor: 1.0)</u>
<u>ConvF</u>	<u>2.45</u>

B. SAR Measurement Results

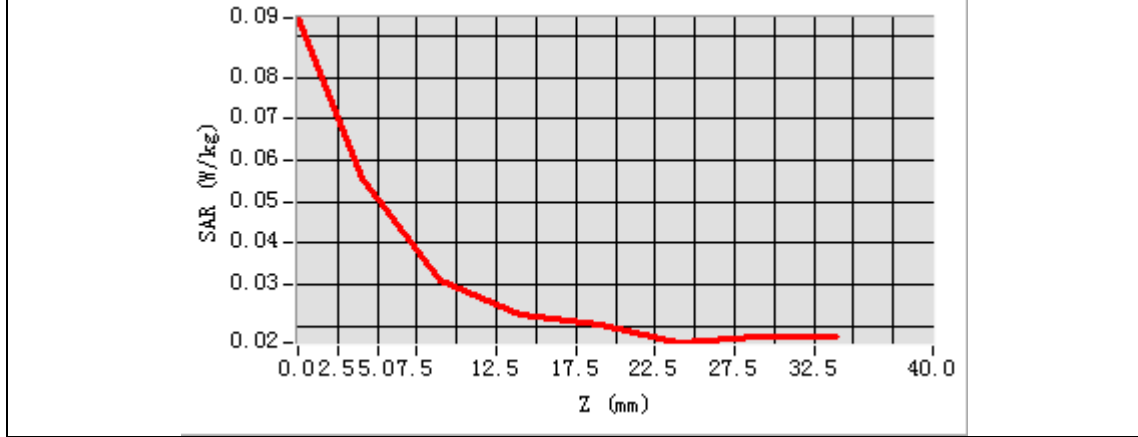
Frequency (MHz)	1745.000000
Relative permittivity (real part)	40.035427
Relative permittivity (imaginary part)	13.860971
Conductivity (S/m)	1.343744
Variation (%)	-4.080000



Maximum location: X=-80.00, Y=-21.00
SAR Peak: 0.08 W/kg

SAR 10g (W/Kg)	0.036593
SAR 1g (W/Kg)	0.048007

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.0944	0.0558	0.0308	0.0229	0.0205	0.0159	0.0175



3D screen shot	Hot spot position

MEASUREMENT 34

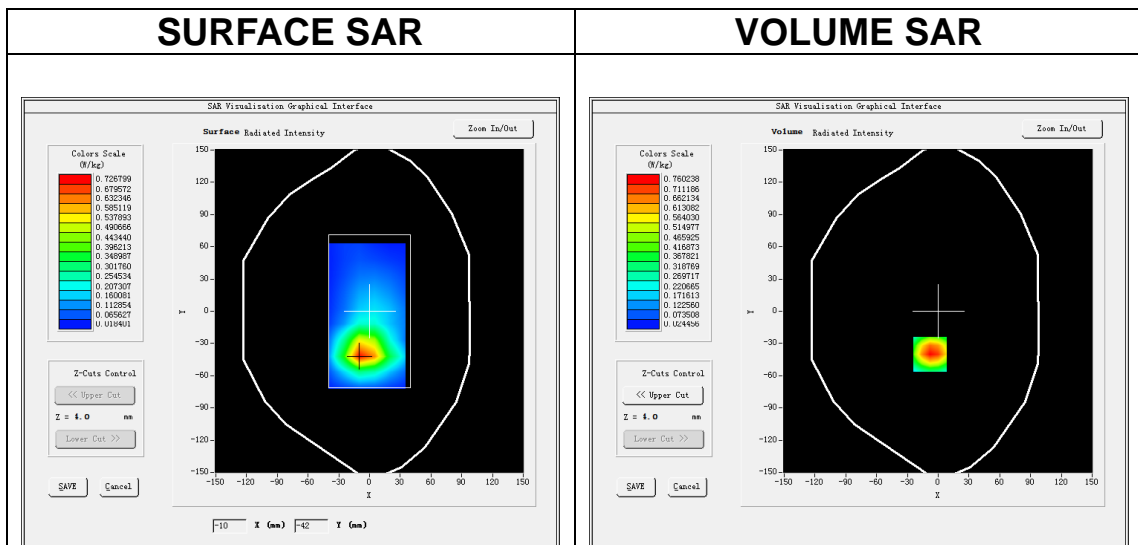
Date of measurement: 6/12/2023

A. Experimental conditions.

<u>Area Scan</u>	<u>dx=15mm dy=15mm, h= 5.00 mm</u>
<u>ZoomScan</u>	<u>5x5x7, dx=8mm dy=8mm dz=5mm</u>
<u>Phantom</u>	<u>Validation plane</u>
<u>Device Position</u>	<u>Body</u>
<u>Band</u>	<u>FDDBand66</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>(Crest factor: 1.0)</u>
<u>ConvF</u>	<u>2.45</u>

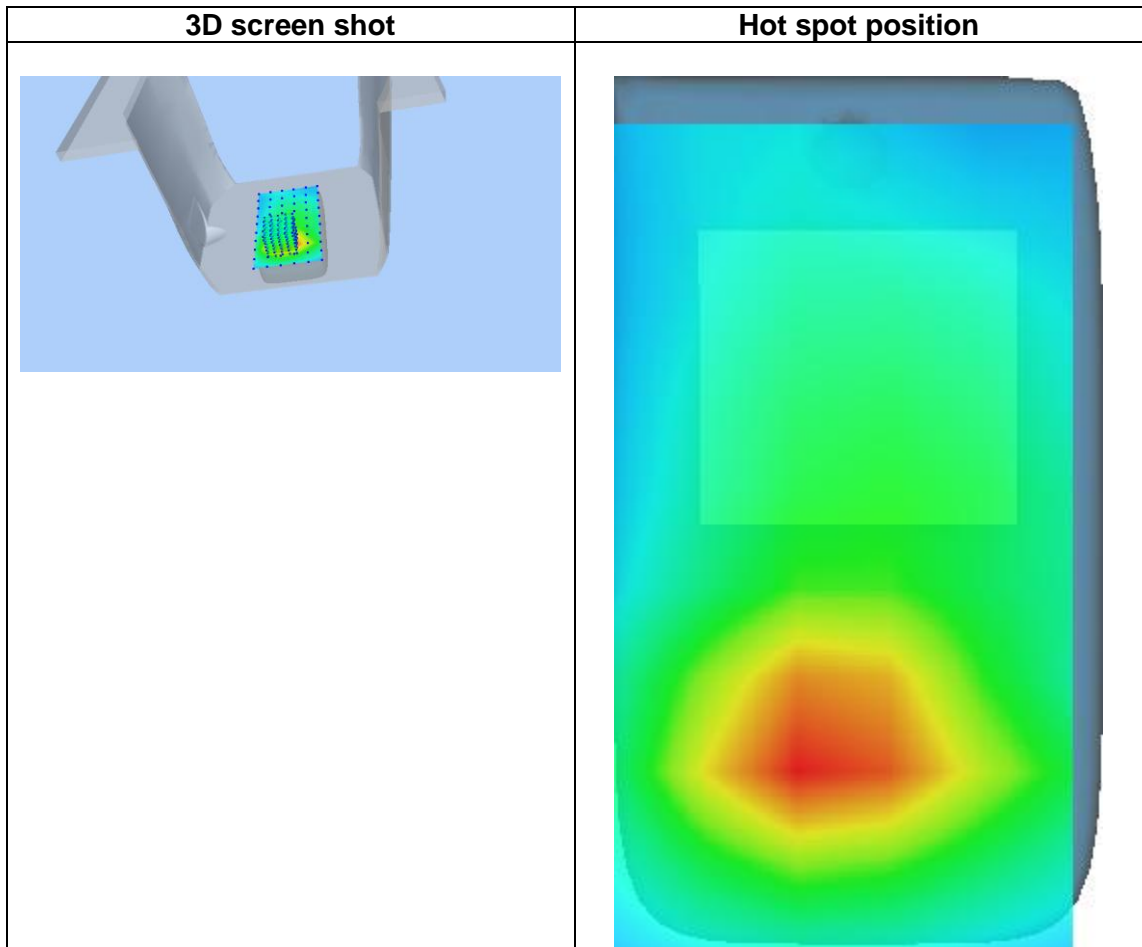
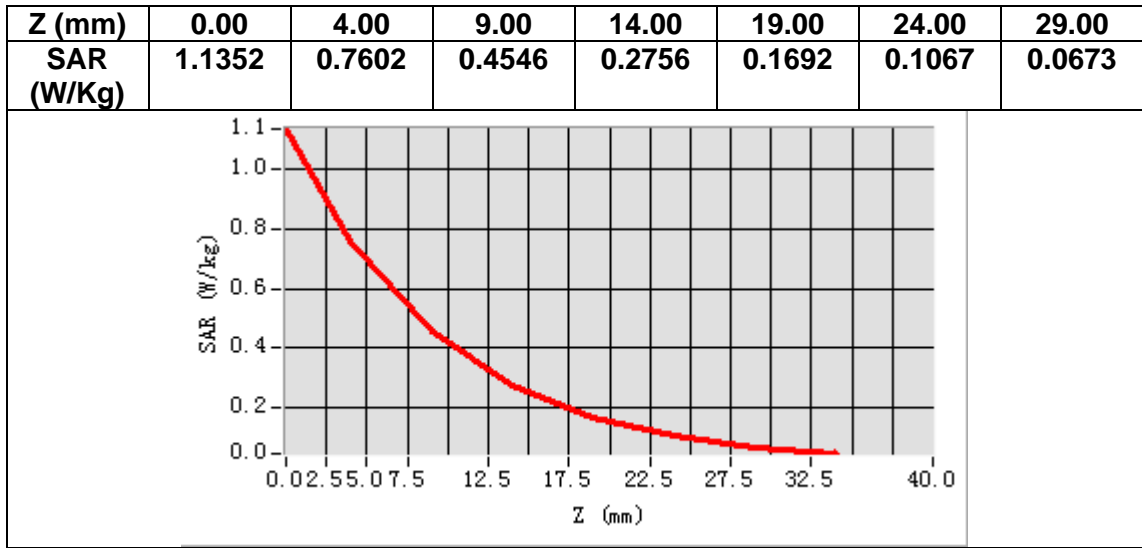
B. SAR Measurement Results

Frequency (MHz)	1745.000000
Relative permittivity (real part)	40.035427
Relative permittivity (imaginary part)	13.860971
Conductivity (S/m)	1.343744
Variation (%)	-0.710000



Maximum location: X=-8.00, Y=-40.00
SAR Peak: 1.14 W/kg

SAR 10g (W/Kg)	0.406718
SAR 1g (W/Kg)	0.723220



2. Appendix D. Calibration Certificate

Table of contents
E Field Probe - 3423-EPGO-426
750 MHz Dipole - SN 03/15 DIP 0G750-355
835 MHz Dipole - SN 03/15 DIP 0G835-347
1800 MHz Dipole - SN 03/15 DIP 1G800-349
1900 MHz Dipole - SN 03/15 DIP 1G900-350
2450 MHz Dipole - SN 03/15 DIP 2G450-352
2600 MHz Dipole - SN 03/15 DIP 2G600-356
5000-6000 MHz Dipole - SN 13/14 WGA 33
Extended Calibration Certificate



COMOSAR E-Field Probe Calibration Report

Ref : ACR.261.11.23.BES.A

**SHENZHEN NTEK TESTING TECHNOLOGY
CO., LTD.**

**BUILDING E, FENDA SCIENCE PARK, SANWEI
COMMUNITY, XIXIANG STREET,
BAO'AN DISTRICT, SHENZHEN GUANGDONG, CHINA
MVG COMOSAR DOSIMETRIC E-FIELD PROBE
SERIAL NO.: 3423-EPGO-426**

Calibrated at MVG

Z.I. de la pointe du diable

**Technopôle Brest Iroise – 295 avenue Alexis de Rochon
29280 PLOUZANE - FRANCE**

Calibration date: 09/18/2023



Accreditations #2-6789
Scope available on www.cofrac.fr

The use of the Cofrac brand and the accreditation references is prohibited from any reproduction.




Summary:

This document presents the method and results from an accredited COMOSAR Dosimetric E-Field Probe calibration performed at MVG, using the CALIPROBE test bench, for use with a MVG COMOSAR system only. The test results covered by accreditation are traceable to the International System of Units (SI).



COMOSAR E-FIELD PROBE CALIBRATION REPORT

Ref: ACR.261.11.23.BES.A

	<i>Name</i>	<i>Function</i>	<i>Date</i>	<i>Signature</i>
<i>Prepared by:</i>	Cyrille ONNEE	Measurement Responsible	9/18/2023	
<i>Checked & approved by:</i>	Jérôme Luc	Technical Manager	9/18/2023	
<i>Authorized by:</i>	Yann Toutain	Laboratory Director	9/19/2023	

Yann
Toutain ID  Signature numérique de Yann Toutain ID
Date: 2023.09.19 09:08:14 +02'00'

	<i>Customer Name</i>
<i>Distribution :</i>	SHENZHEN NTEK TESTING TECHNOLOGY CO., LTD.

<i>Issue</i>	<i>Name</i>	<i>Date</i>	<i>Modifications</i>
A	Cyrille ONNEE	9/18/2023	Initial release



COMOSAR E-FIELD PROBE CALIBRATION REPORT

Ref: ACR.261.11.23.BES.A

TABLE OF CONTENTS

1 Device Under Test 4

2 Product Description 4

 2.1 General Information 4

3 Measurement Method 4

 3.1 Sensitivity 4

 3.2 Linearity 5

 3.3 Isotropy 5

 3.4 Boundary Effect 5

4 Measurement Uncertainty 6

5 Calibration Results 6

 5.1 Calibration in air 6

 5.2 Calibration in liquid 7

6 Verification Results 8

7 List of Equipment 9



COMOSAR E-FIELD PROBE CALIBRATION REPORT

Ref: ACR.261.11.23.BES.A

1 DEVICE UNDER TEST

Device Under Test	
Device Type	COMOSAR DOSIMETRIC E FIELD PROBE
Manufacturer	MVG
Model	SSE2
Serial Number	3423-EPGO-426
Product Condition (new / used)	New
Frequency Range of Probe	0.15 GHz-7.5GHz
Resistance of Three Dipoles at Connector	Dipole 1: R1=0.261 MΩ Dipole 2: R2=0.213 MΩ Dipole 3: R3=0.233 MΩ

2 PRODUCT DESCRIPTION

2.1 GENERAL INFORMATION

MVG’s COMOSAR E field Probes are built in accordance to the IEC/IEEE 62209-1528 and FCC KDB865664 D01 standards.



Figure 1 – MVG COMOSAR Dosimetric E field Probe

Probe Length	330 mm
Length of Individual Dipoles	2 mm
Maximum external diameter	8 mm
Probe Tip External Diameter	2.5 mm
Distance between dipoles / probe extremity	1 mm

3 MEASUREMENT METHOD

The IEC/IEEE 62209-1528 and FCC KDB865664 D01 standards provide recommended practices for the probe calibrations, including the performance characteristics of interest and methods by which to assess their effect. All calibrations / measurements performed meet the fore-mentioned standards.

3.1 SENSITIVITY

The sensitivity factors of the three dipoles were determined using a two step calibration method (air and tissue simulating liquid) using waveguides as outlined in the standards for frequency range 600-7500MHz and using the calorimeter cell method (transfer method) as outlined in the standards for frequency 150-450 MHz.



COMOSAR E-FIELD PROBE CALIBRATION REPORT

Ref: ACR.261.11.23.BES.A

3.2 LINEARITY

The evaluation of the linearity was done in free space using the waveguide, performing a power sweep to cover the SAR range 0.01W/kg to 100W/kg.

3.3 ISOTROPY

The axial isotropy was evaluated by exposing the probe to a reference wave from a standard dipole with the dipole mounted under the flat phantom in the test configuration suggested for system validations and checks. The probe was rotated along its main axis from 0 to 360 degrees in 15-degree steps. The hemispherical isotropy is determined by inserting the probe in a thin plastic box filled with tissue-equivalent liquid, with the plastic box illuminated with the fields from a half wave dipole. The dipole is rotated about its axis (0°-180°) in 15° increments. At each step the probe is rotated about its axis (0°-360°).

3.4 BOUNDARY EFFECT

The boundary effect is defined as the deviation between the SAR measured data and the expected exponential decay in the liquid when the probe is oriented normal to the interface. To evaluate this effect, the liquid filled flat phantom is exposed to fields from either a reference dipole or waveguide. With the probe normal to the phantom surface, the peak spatial average SAR is measured and compared to the analytical value at the surface.

The boundary effect uncertainty can be estimated according to the following uncertainty approximation formula based on linear and exponential extrapolations between the surface and $d_{be} + d_{step}$ along lines that are approximately normal to the surface:

$$SAR_{uncertainty} [\%] = \Delta SAR_{be} \frac{(d_{be} + d_{step})^2}{2d_{step}} \frac{(e^{-d_{be}/\delta})}{\delta/2} \text{ for } (d_{be} + d_{step}) < 10 \text{ mm}$$

where

- $SAR_{uncertainty}$ is the uncertainty in percent of the probe boundary effect
- d_{be} is the distance between the surface and the closest *zoom-scan* measurement point, in millimetre
- Δ_{step} is the separation distance between the first and second measurement points that are closest to the phantom surface, in millimetre, assuming the boundary effect at the second location is negligible
- δ is the minimum penetration depth in millimetres of the head tissue-equivalent liquids defined in this standard, i.e., $\delta \approx 14$ mm at 3 GHz;
- ΔSAR_{be} in percent of SAR is the deviation between the measured SAR value, at the distance d_{be} from the boundary, and the analytical SAR value.

The measured worst case boundary effect SARuncertainty[%] for scanning distances larger than 4mm is 1.0% Limit ,2%).



COMOSAR E-FIELD PROBE CALIBRATION REPORT

Ref: ACR.261.11.23.BES.A

4 MEASUREMENT UNCERTAINTY

The guidelines outlined in the IEC/IEEE 62209-1528 and FCC KDB865664 D01 standards were followed to generate the measurement uncertainty associated with a SAR probe calibration using the waveguide or calorimetric cell technique depending on the frequency.

The estimated expanded uncertainty (k=2) in calibration for SAR (W/kg) is +/-11% for the frequency range 150-450MHz.

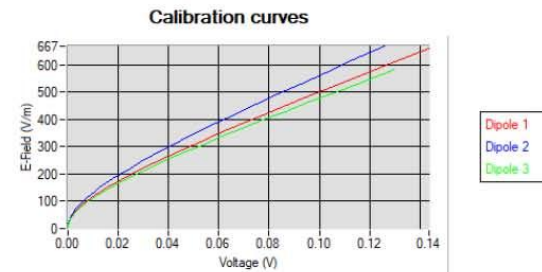
The estimated expanded uncertainty (k=2) in calibration for SAR (W/kg) is +/-14% for the frequency range 600-7500MHz.

5 CALIBRATION RESULTS

Ambient condition	
Liquid Temperature	20 +/- 1 °C
Lab Temperature	20 +/- 1 °C
Lab Humidity	30-70 %

5.1 CALIBRATION IN AIR

The following curve represents the measurement in waveguide of the voltage picked up by the probe toward the E-field generated inside the waveguide.



From this curve, the sensitivity in air is calculated using the below formula.

$$E^2 = \sum_{i=1}^3 \frac{V_i (1 + V_i / DCP_i)}{Norm_i}$$

where

Vi=voltage readings on the 3 channels of the probe

DCPi=diode compression point given below for the 3 channels of the probe

Normi=dipole sensitivity given below for the 3 channels of the probe



COMOSAR E-FIELD PROBE CALIBRATION REPORT

Ref: ACR.261.11.23.BES.A

Normx dipole 1 ($\mu\text{V}/(\text{V}/\text{m})^2$)	Normy dipole 2 ($\mu\text{V}/(\text{V}/\text{m})^2$)	Normz dipole 3 ($\mu\text{V}/(\text{V}/\text{m})^2$)
0.78	0.62	0.85

DCP dipole 1 (mV)	DCP dipole 2 (mV)	DCP dipole 3 (mV)
105	108	107

5.2 CALIBRATION IN LIQUID

The calorimeter cell or the waveguide is used to determine the calibration in liquid using the formula below.

$$ConvF = \frac{E_{liquid}^2}{E_{air}^2}$$

The E-field in the liquid is determined from the SAR measurement according to the below formula.

$$E_{liquid}^2 = \frac{\rho SAR}{\sigma}$$

where

σ =the conductivity of the liquid

ρ =the volumetric density of the liquid

SAR=the SAR measured from the formula that depends on the setup used. The SAR formulas are given below

For the calorimeter cell (150-450 MHz), the formula is:

$$SAR = c \frac{dT}{dt}$$

where

c =the specific heat for the liquid

dT/dt =the temperature rises over the time

For the waveguide setup (600-75000 MHz), the formula is:

$$SAR = \frac{4P_w}{ab\delta} e^{-\frac{2z}{\delta}}$$

where

a =the larger cross-sectional of the waveguide

b =the smaller cross-sectional of the waveguide

δ =the skin depth for the liquid in the waveguide

P_w =the power delivered to the liquid



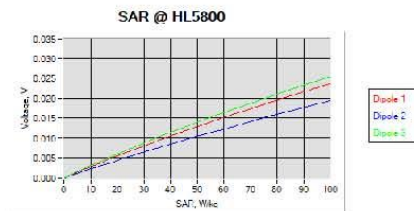
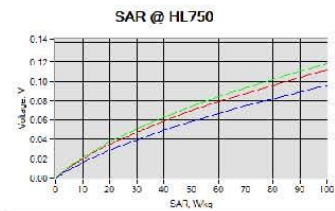
COMOSAR E-FIELD PROBE CALIBRATION REPORT

Ref: ACR.261.11.23.BES.A

The below table summarize the ConvF for the calibrated liquid. The curves give examples for the measured SAR depending on the voltage in some liquid.

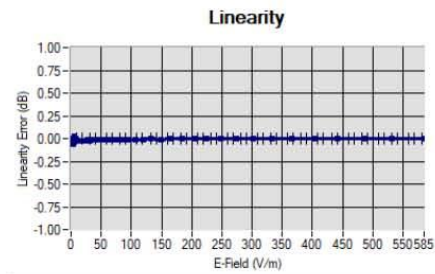
Liquid	Frequency (MHz*)	ConvF
HL750	750	2.37
HL850	835	2.32
HL900	900	2.23
HL1800	1800	2.45
HL1900	1900	2.63
HL2000	2000	2.83
HL2300	2300	2.81
HL2450	2450	2.85
HL2600	2600	2.65
HL3300	3300	2.21
HL3500	3500	2.20
HL3700	3700	2.11
HL3900	3900	2.40
HL4200	4200	2.40
HL4600	4600	2.33
HL4900	4900	2.37
HL5200	5200	2.07
HL5400	5400	2.11
HL5600	5600	2.20
HL5800	5800	2.04

(*) Frequency validity is +/-50MHz below 600MHz, +/-100MHz from 600MHz to 6GHz and +/-700MHz above 6GHz

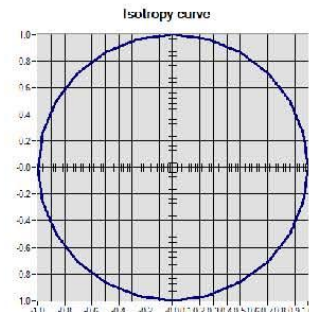


6 VERIFICATION RESULTS

The figures below represent the measured linearity and axial isotropy for this probe. The probe specification is +/-0.2 dB for linearity and +/-0.15 dB for axial isotropy.



Linearity: +/- 1.42% (+/- 0.06dB)



Isotropy: +/- 0.21% (+/- 0.01dB)



COMOSAR E-FIELD PROBE CALIBRATION REPORT

Ref: ACR.261.11.23.BES.A

7 LIST OF EQUIPMENT

Equipment Summary Sheet				
Equipment Description	Manufacturer / Model	Identification No.	Current Calibration Date	Next Calibration Date
CALIPROBE Test Bench	Version 2	NA	Validated. No cal required.	Validated. No cal required.
Network Analyzer	Rohde & Schwarz ZVM	100203	08/2021	08/2024
Network Analyzer	Agilent 8753ES	MY40003210	10/2019	10/2023
Network Analyzer – Calibration kit	HP 85033D	3423A08186	06/2021	06/2027
Network Analyzer – Calibration kit	Rohde & Schwarz ZV-Z235	101223	07/2022	07/2025
Multimeter	Keithley 2000	4013982	02/2023	02/2026
Signal Generator	Rohde & Schwarz SMB	106589	03/2022	03/2025
Amplifier	MVG	MODU-023-C-0002	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Power Meter	NI-USB 5680	170100013	06/2021	06/2024
Power Meter	Keysight U2000A	SN: MY62340002	10/2022	10/2025
Directional Coupler	Krytar 158020	131467	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Fluoroptic Thermometer	LumaSense Luxtron 812	94264	09/2022	09/2025
Coaxial cell	MVG	SN 32/16 COAXCELL_1	Validated. No cal required.	Validated. No cal required.
Waveguide	MVG	SN 32/16 WG2_1	Validated. No cal required.	Validated. No cal required.
Liquid transition	MVG	SN 32/16 WGLIQ_0G600_1	Validated. No cal required.	Validated. No cal required.

Page: 9/10

Template_ACR.DDD.N.YY.MVGB.ISSUE_COMOSAR Probe vL

This document shall not be reproduced, except in full or in part, without the written approval of MVG. The information contained herein is to be used only for the purpose for which it is submitted and is not to be released in whole or part without written approval of MVG.



COMOSAR E-FIELD PROBE CALIBRATION REPORT

Ref: ACR.261.11.23.BES.A

Waveguide	MVG	SN 32/16 WG4_1	Validated. No cal required.	Validated. No cal required.
Liquid transition	MVG	SN 32/16 WGLIQ_0G900_1	Validated. No cal required.	Validated. No cal required.
Waveguide	MVG	SN 32/16 WG6_1	Validated. No cal required.	Validated. No cal required.
Liquid transition	MVG	SN 32/16 WGLIQ_1G500_1	Validated. No cal required.	Validated. No cal required.
Waveguide	MVG	SN 32/16 WG8_1	Validated. No cal required.	Validated. No cal required.
Liquid transition	MVG	SN 32/16 WGLIQ_1G800B_1	Validated. No cal required.	Validated. No cal required.
Liquid transition	MVG	SN 32/16 WGLIQ_1G800H_1	Validated. No cal required.	Validated. No cal required.
Waveguide	MVG	SN 32/16 WG10_1	Validated. No cal required.	Validated. No cal required.
Liquid transition	MVG	SN 32/16 WGLIQ_3G500_1	Validated. No cal required.	Validated. No cal required.
Waveguide	MVG	SN 32/16 WG12_1	Validated. No cal required.	Validated. No cal required.
Liquid transition	MVG	SN 32/16 WGLIQ_5G000_1	Validated. No cal required.	Validated. No cal required.
Waveguide	MVG	SN 32/16 WG14_1	Validated. No cal required.	Validated. No cal required.
Liquid transition	MVG	SN 32/16 WGLIQ_7G000_1	Validated. No cal required.	Validated. No cal required.
Temperature / Humidity Sensor	Testo 184 H1	44225320	06/2021	06/2024



SAR Reference Dipole Calibration Report

Ref : ACR.60.2.21.MVGB.A

SHENZHEN NTEK TESTING TECHNOLOGY CO., LTD.

BUILDING E, FENDA SCIENCE PARK, SANWEI
COMMUNITY, XIXIANG STREET,
BAO'AN DISTRICT, SHENZHEN GUANGDONG, CHINA
MVG COMOSAR REFERENCE DIPOLE

FREQUENCY: 750 MHZ

SERIAL NO.: SN 03/15 DIP0G750-355

Calibrated at MVG

Z.I. de la pointe du diable

Technopôle Brest Iroise – 295 avenue Alexis de Rochon
29280 PLOUZANE - FRANCE

Calibration date: 03/01/2021



Accreditations #2-6789 and #2-6814
Scope available on www.cofrac.fr

Summary:

This document presents the method and results from an accredited SAR reference dipole calibration performed at MVG, using the COMOSAR test bench. The test results covered by accreditation are traceable to the International System of Units (SI).



SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref. ACR.60.2.21.MVGB.A

	<i>Name</i>	<i>Function</i>	<i>Date</i>	<i>Signature</i>
<i>Prepared by :</i>	Jérôme Luc	Technical Manager	3/1/2021	<i>JL</i>
<i>Checked by :</i>	Jérôme Luc	Technical Manager	3/1/2021	<i>JL</i>
<i>Approved by :</i>	Yann Toutain	Laboratory Director	3/1/2021	<i>Yann Toutain</i>

2021.03.0
 1 13:08:18
 +01'00'

<i>Distribution :</i>	<i>Customer Name</i> SHENZHEN NTEK TESTING TECHNOLOGY CO., LTD.
-----------------------	---

<i>Issue</i>	<i>Name</i>	<i>Date</i>	<i>Modifications</i>
A	Jérôme Luc	3/1/2021	Initial release



SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref. ACR.60.2.21.MVGB.A

TABLE OF CONTENTS

1	Introduction.....	4
2	Device Under Test	4
3	Product Description	4
3.1	General Information	4
4	Measurement Method	5
4.1	Return Loss Requirements	5
4.2	Mechanical Requirements	5
5	Measurement Uncertainty.....	5
5.1	Return Loss	5
5.2	Dimension Measurement	5
5.3	Validation Measurement	5
6	Calibration Measurement Results.....	6
6.1	Return Loss and Impedance	6
6.2	Mechanical Dimensions	6
7	Validation measurement	7
7.1	Measurement Condition	7
7.2	Head Liquid Measurement	7
7.3	Measurement Result	8
8	List of Equipment	10



SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref. ACR.60.2.21.MVGB.A

1 INTRODUCTION

This document contains a summary of the requirements set forth by the IEEE 1528, FCC KDBs and CEI/IEC 62209 standards for reference dipoles used for SAR measurement system validations and the measurements that were performed to verify that the product complies with the fore mentioned standards.

2 DEVICE UNDER TEST

Device Under Test	
Device Type	COMOSAR 750 MHz REFERENCE DIPOLE
Manufacturer	MVG
Model	SID750
Serial Number	SN 03/15 DIP0G750-355
Product Condition (new / used)	Used

3 PRODUCT DESCRIPTION

3.1 GENERAL INFORMATION

MVG’s COMOSAR Validation Dipoles are built in accordance to the IEEE 1528, FCC KDBs and CEI/IEC 62209 standards. The product is designed for use with the COMOSAR test bench only.



Figure 1 – MVG COMOSAR Validation Dipole



SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.60.2.21.MVGB.A

4 MEASUREMENT METHOD

The IEEE 1528, FCC KDBs and CEI/IEC 62209 standards provide requirements for reference dipoles used for system validation measurements. The following measurements were performed to verify that the product complies with the fore mentioned standards.

4.1 RETURN LOSS REQUIREMENTS

The dipole used for SAR system validation measurements and checks must have a return loss of -20 dB or better. The return loss measurement shall be performed against a liquid filled flat phantom, with the phantom constructed as outlined in the fore mentioned standards. A direct method is used with a network analyser and its calibration kit, both with a valid ISO17025 calibration.

4.2 MECHANICAL REQUIREMENTS

The IEEE Std. 1528 and CEI/IEC 62209 standards specify the mechanical components and dimensions of the validation dipoles, with the dimension's frequency and phantom shell thickness dependent. The COMOSAR test bench employs a 2 mm phantom shell thickness therefore the dipoles sold for use with the COMOSAR test bench comply with the requirements set forth for a 2 mm phantom shell thickness. A direct method is used with a ISO17025 calibrated caliper.

5 MEASUREMENT UNCERTAINTY

All uncertainties listed below represent an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2, traceable to the Internationally Accepted Guides to Measurement Uncertainty.

5.1 RETURN LOSS

The following uncertainties apply to the return loss measurement:

Frequency band	Expanded Uncertainty on Return Loss
400-6000MHz	0.08 LIN

5.2 DIMENSION MEASUREMENT

The following uncertainties apply to the dimension measurements:

Length (mm)	Expanded Uncertainty on Length
0 - 300	0.20 mm
300 - 450	0.44 mm

5.3 VALIDATION MEASUREMENT

The guidelines outlined in the IEEE 1528, FCC KDBs, CENELEC EN50361 and CEI/IEC 62209 standards were followed to generate the measurement uncertainty for validation measurements.

Scan Volume	Expanded Uncertainty