

WCDMA Band V

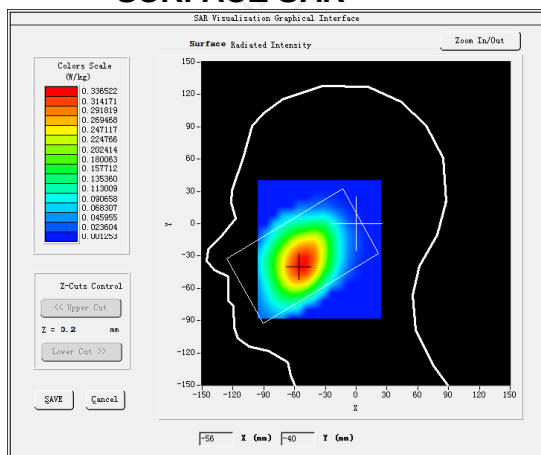
MEASUREMENT 1

High Band SAR (Channel 4233):

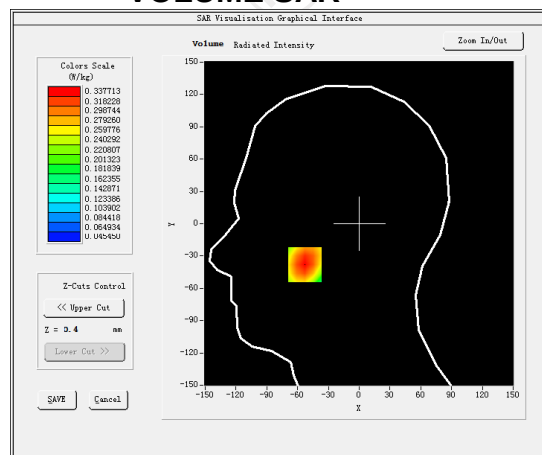
Date: 05/20/2024

Frequency (MHz)	846.600000
Relative permittivity (real part)	41.500000
Relative permittivity (imaginary part)	19.400000
Conductivity (S/m)	0.901453
Variation (%)	0.720000
Crest Factor:	1.0
Probe Conversion factor	1.80
E-Field Probe:	SSE2 (SN 25/22 EPG0375)
Area Scan	<u>dx=8mm dy=8mm, h= 5.00 mm</u>
ZoomScan	<u>5x5x7, dx=8mm dy=8mm</u> <u>dz=5mm, Complete/ndx=8mm dy=8mm, h=</u> <u>5.00 mm</u>
Phantom	<u>Left head</u>
Device Position	<u>Cheek</u>
Band	<u>BAND5 WCDMA850</u>

SURFACE SAR



VOLUME SAR



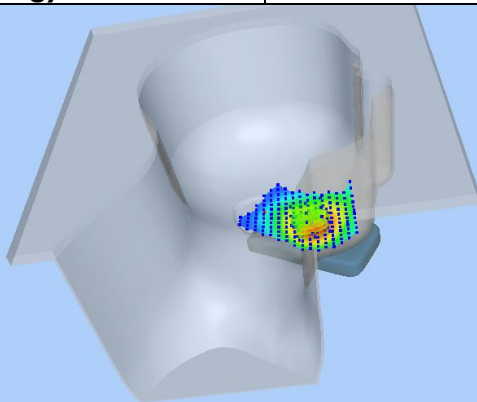
Maximum location: X=-53.00, Y=-38.00 SAR Peak: 0.31 W/kg

SAR 10g (W/Kg)

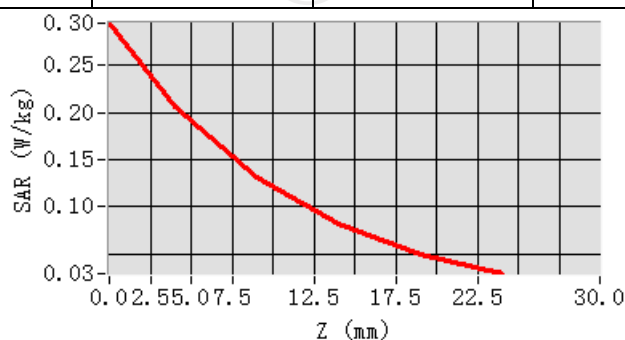
0.103611

SAR 1g (W/Kg)

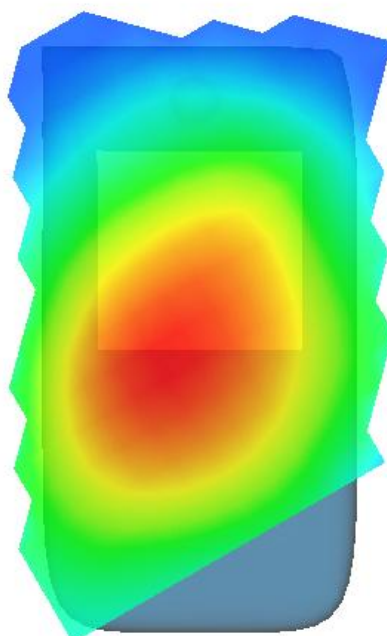
0.165741



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.2950	0.2071	0.1304	0.0811	0.0500



Hot spot position



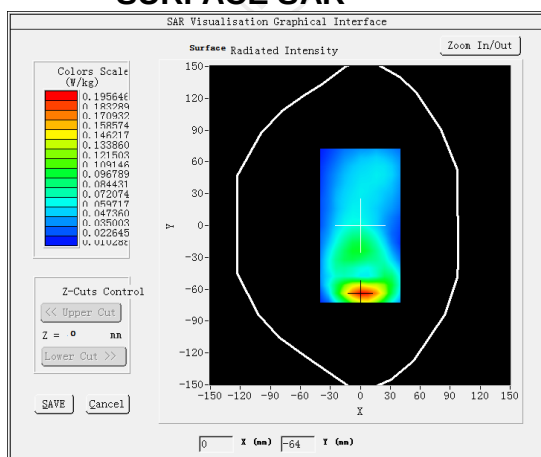
MEASUREMENT 2

High Band SAR (Channel 4233):

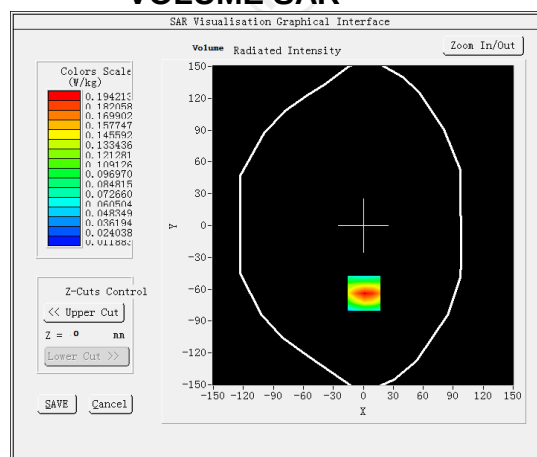
Date: 05/20/2024

Frequency (MHz)	826.600000
Relative permittivity (real part)	41.500000
Relative permittivity (imaginary part)	19.400000
Conductivity (S/m)	0.901453
Variation (%)	-2.490000
Crest Factor:	1.0
Probe Conversion factor	1.80
E-Field Probe:	SSE2 (SN 25/22 EPG0375)
Area Scan	<u>dx=8mm dy=8mm, h= 5.00 mm</u>
ZoomScan	<u>5x5x7,dx=8mm dy=8mm</u> <u>dz=5mm,Complete/ndx=8mm dy=8mm, h=</u> <u>5.00 mm</u>
Phantom	<u>Validation plane</u>
Device Position	<u>Body back(10mm)</u>
Band	<u>BAND5 WCDMA850</u>

SURFACE SAR

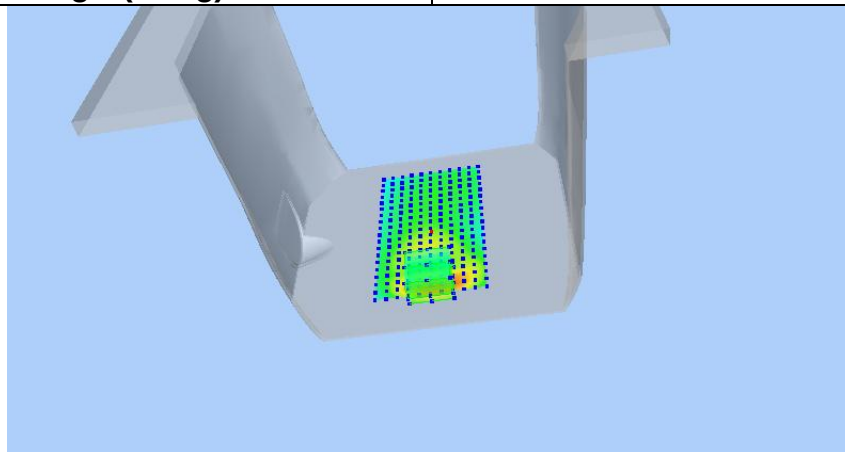


VOLUME SAR

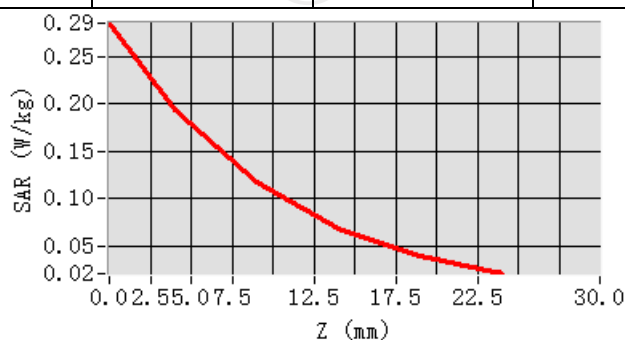


Maximum location: X=1.00, Y=-64.00 SAR Peak: 0.29 W/kg

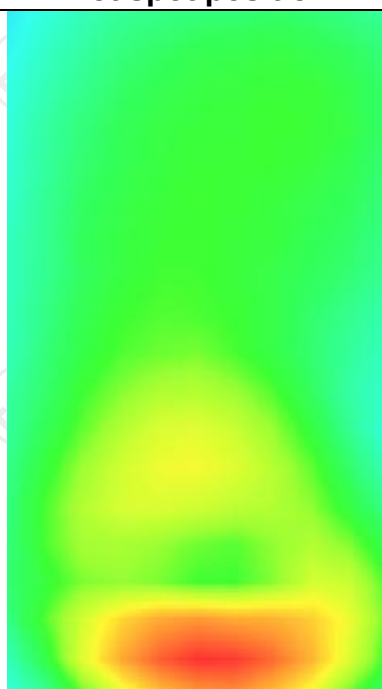
SAR 10g (W/Kg)	0.118976
SAR 1g (W/Kg)	0.132105



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.2851	0.1937	0.1176	0.0710	0.0426



Hot spot position



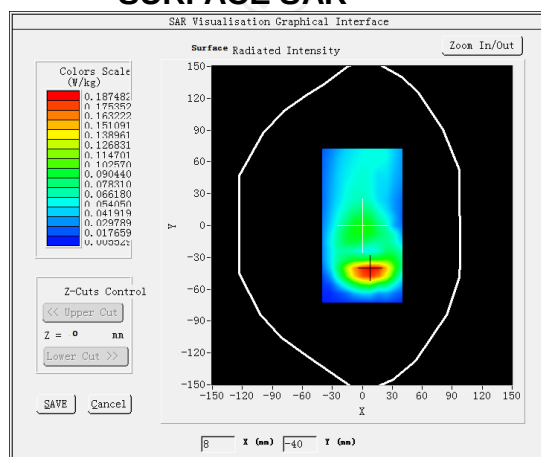
MEASUREMENT 3

High Band SAR (Channel 4233):

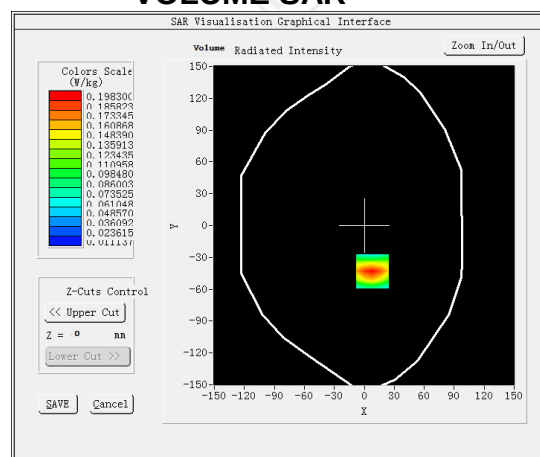
Date: 05/20/2024

Frequency (MHz)	846.600000
Relative permittivity (real part)	41.500000
Relative permittivity (imaginary part)	19.400000
Conductivity (S/m)	0.901453
Variation (%)	0.010000
Crest Factor:	1.0
Probe Conversion factor	1.80
E-Field Probe:	SSE2 (SN 25/22 EPG0375)
Area Scan	<u>dx=8mm dy=8mm, h= 5.00 mm</u>
ZoomScan	<u>5x5x7, dx=8mm dy=8mm</u> <u>dz=5mm, Complete/ndx=8mm dy=8mm, h=</u> <u>5.00 mm</u>
Phantom	<u>Validation plane</u>
Device Position	<u>Body back(10mm)</u>
Band	<u>BAND5 WCDMA850(hotspot)</u>

SURFACE SAR



VOLUME SAR



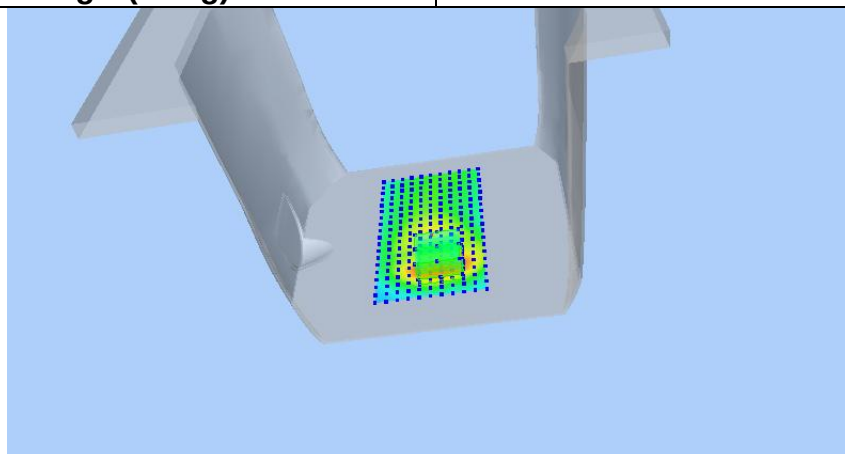
Maximum location: X=8.00, Y=-43.00 SAR Peak: 0.30 W/kg

SAR 10g (W/Kg)

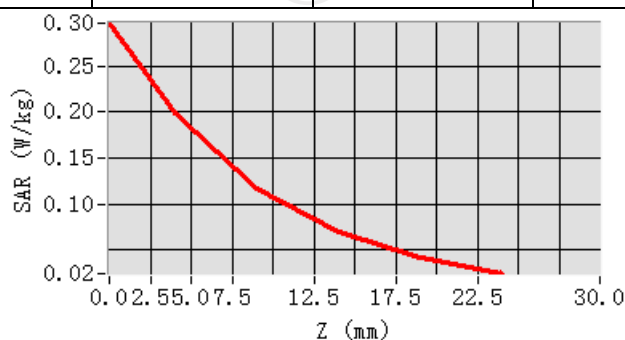
0.103128

SAR 1g (W/Kg)

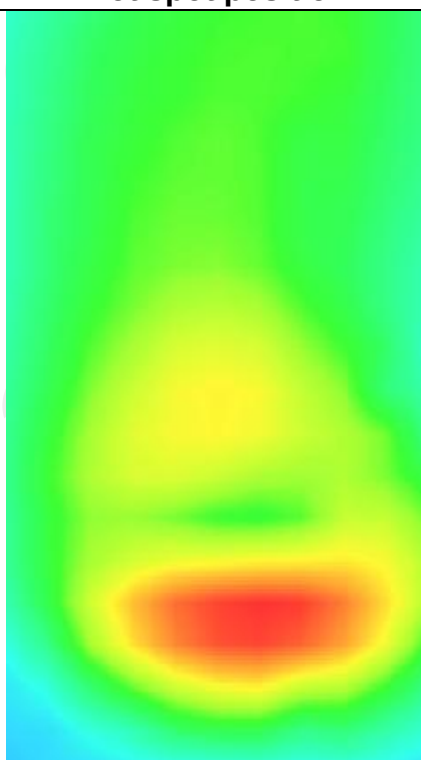
0.142057



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.2970	0.1983	0.1171	0.0691	0.0416



Hot spot position



LTE Band 2

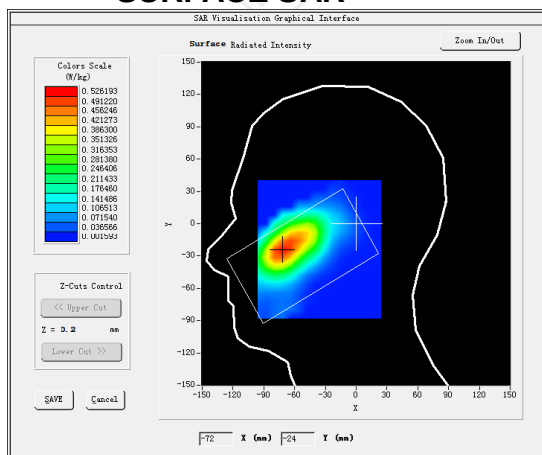
MEASUREMENT 1

Low Band SAR (Channel 18700):

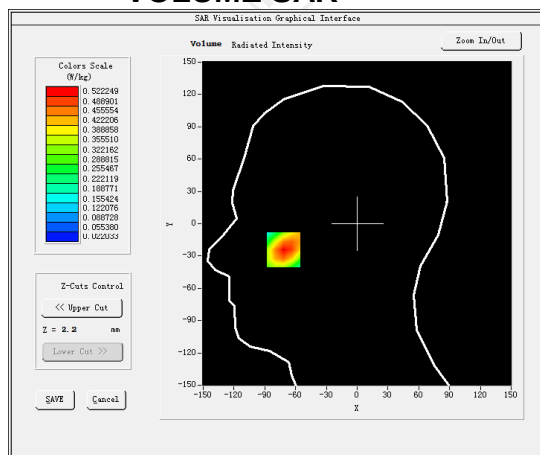
Date: 05/24/2024

Frequency (MHz)	1860.000000
Relative permittivity (real part)	40.000000
Relative permittivity (imaginary part)	13.411700
Conductivity (S/m)	1.400405
Variation (%)	1.890000
Crest Factor	1.0
Probe Conversion factor	2.23
E-Field Probe:	SSE2 (SN 25/22 EPG0375)
Area Scan	<u>dx=8mm dy=8mm, h= 5.00 mm</u>
ZoomScan	<u>5x5x7, dx=8mm dy=8mm</u> <u>dz=5mm, Complete/ndx=8mm dy=8mm, h=</u> <u>5.00 mm</u>
Phantom	<u>Left head</u>
Device Position	<u>Cheek</u>
Band	<u>LTE band 2 (1 RB#0)</u>

SURFACE SAR



VOLUME SAR



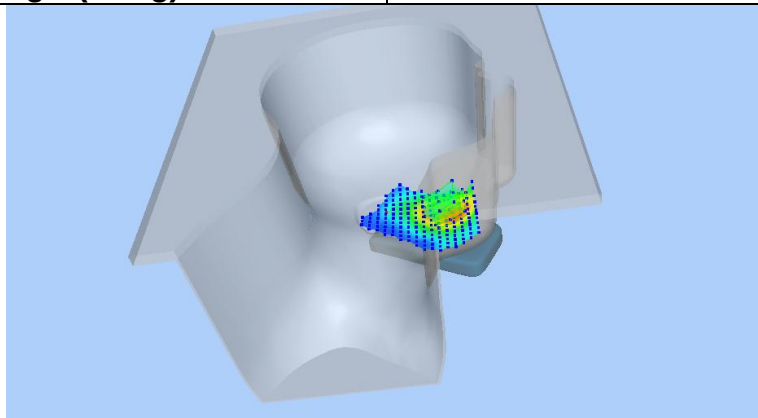
Maximum location: X=-22.00, Y=-21.00 SAR Peak: 0.60 W/kg

SAR 10g (W/Kg)

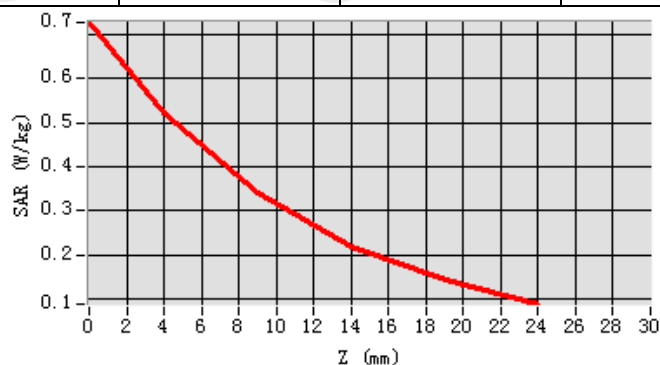
0.268412

SAR 1g (W/Kg)

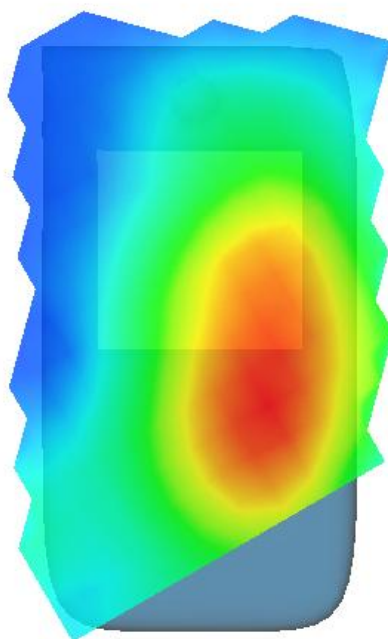
0.300317



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.6282	0.4222	0.3397	0.2201	0.1424



Hot spot position



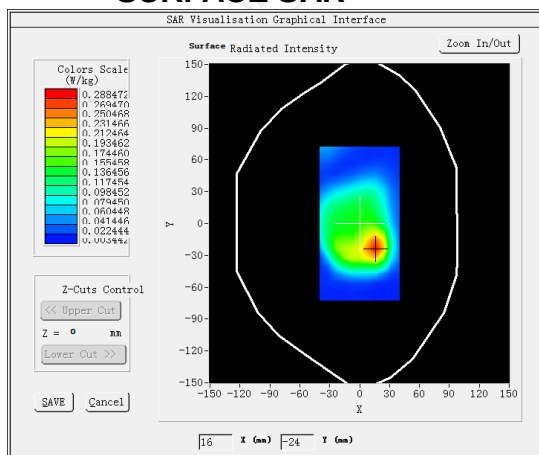
MEASUREMENT 2

Low Band SAR (Channel 18700):

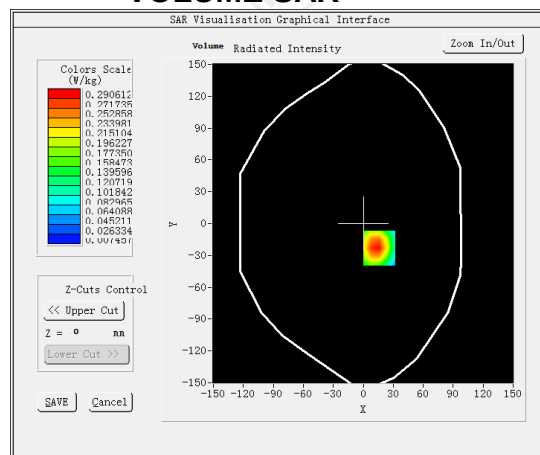
Date: 05/24/2024

Frequency (MHz)	1860.000000
Relative permittivity (real part)	40.000000
Relative permittivity (imaginary part)	13.411700
Conductivity (S/m)	1.400405
Variation (%)	0.820000
Crest Factor	1.0
Probe Conversion factor	2.23
E-Field Probe:	SSE2 (SN 25/22 EPG0375)
Area Scan	<u>dx=8mm dy=8mm, h= 5.00 mm</u>
ZoomScan	<u>5x5x7, dx=8mm dy=8mm</u> <u>dz=5mm, Complete/ndx=8mm dy=8mm, h=</u> <u>5.00 mm</u>
Phantom	<u>Validation plane</u>
Device Position	<u>Body back(10mm)</u>
Band	<u>LTE band 2 (1 RB#0)</u>

SURFACE SAR



VOLUME SAR



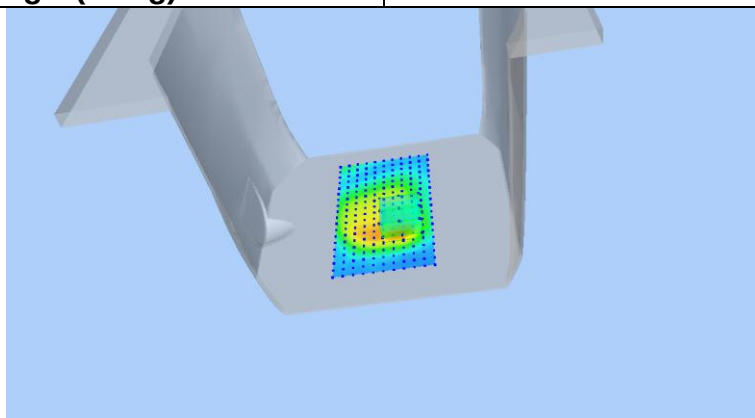
Maximum location: X=16.00, Y=-23.00 SAR Peak: 0.51 W/kg

SAR 10g (W/Kg)

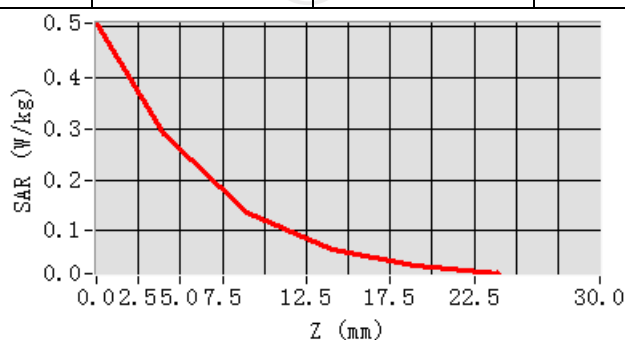
0.140212

SAR 1g (W/Kg)

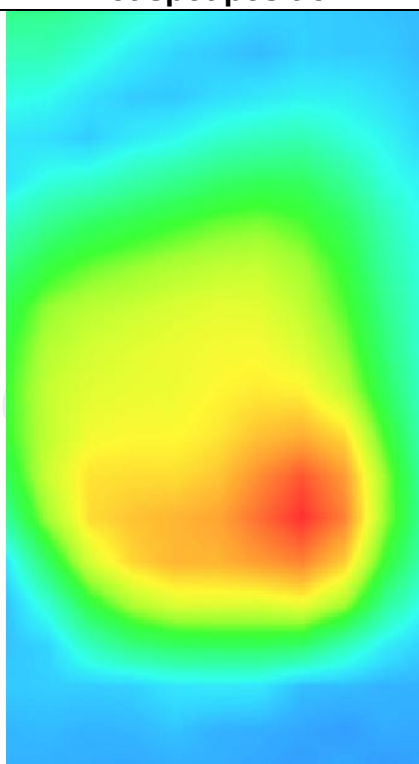
0.278100



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.5066	0.2906	0.1368	0.0636	0.0320



Hot spot position



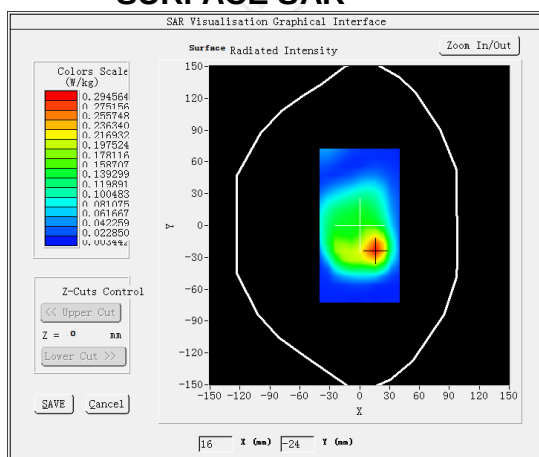
MEASUREMENT 3

Low Band SAR (Channel 18700):

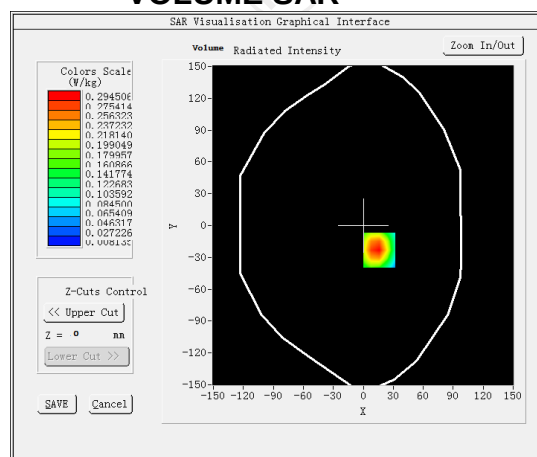
Date: 05/24/2024

Frequency (MHz)	1860.000000
Relative permittivity (real part)	40.000000
Relative permittivity (imaginary part)	13.411700
Conductivity (S/m)	1.400405
Variation (%)	-3.920000
Crest Factor	1.0
Probe Conversion factor	2.23
E-Field Probe:	SSE2 (SN 25/22 EPG0375)
Area Scan	<u>dx=8mm dy=8mm, h= 5.00 mm</u>
ZoomScan	<u>5x5x7, dx=8mm dy=8mm</u> <u>dz=5mm, Complete/ndx=8mm dy=8mm, h=</u> <u>5.00 mm</u>
Phantom	Validation plane
Device Position	Body back(hotspot 10mm)
Band	LTE band 2 (1 RB#0)

SURFACE SAR

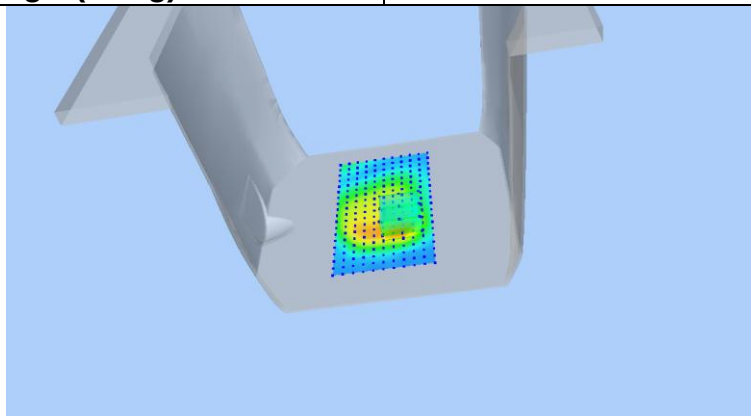


VOLUME SAR

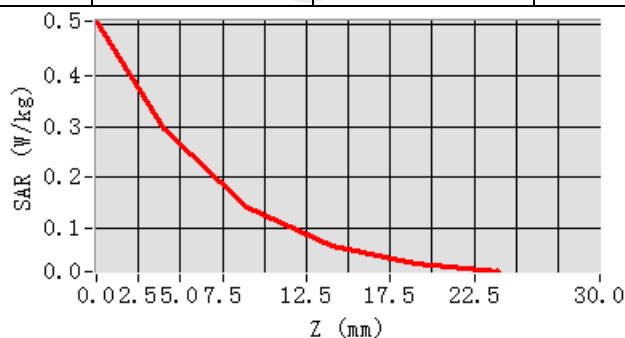


Maximum location: X=16.00, Y=-23.00 SAR Peak: 0.51 W/kg

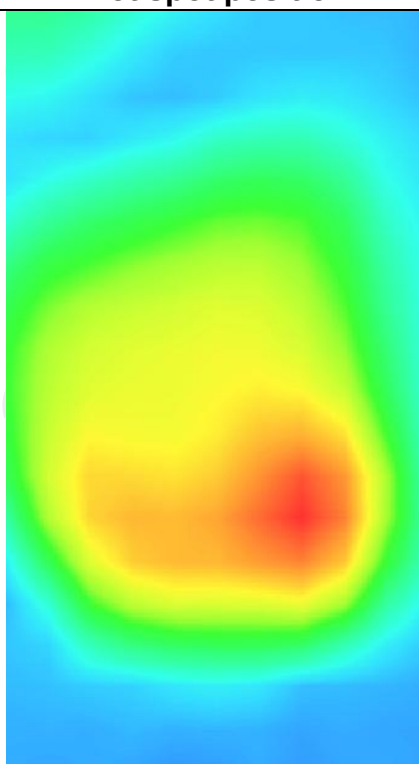
SAR 10g (W/Kg)	0.141891
SAR 1g (W/Kg)	0.280710



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.5058	0.2945	0.1414	0.0665	0.0328



Hot spot position



LTE Band 4

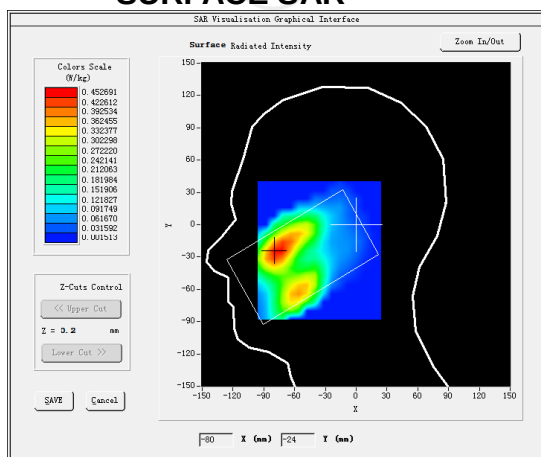
MEASUREMENT 1

Low Band SAR (Channel 20050):

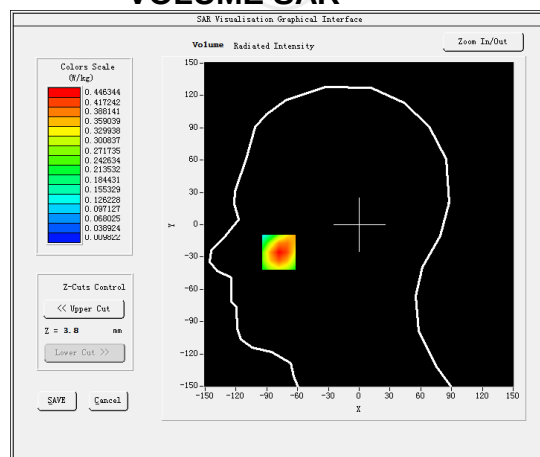
Date: 05/22/2024

Frequency (MHz)	1720.000000
Relative permittivity (real part)	40.115910
Relative permittivity (imaginary part)	14.136136
Conductivity (S/m)	1.360603
Variation (%)	-0.630000
Crest Factor	1.0
Probe Conversion factor	2.08
E-Field Probe:	SSE2 (SN 25/22 EPGO375)
Area Scan	<u>dx=8mm dy=8mm, h= 5.00 mm</u>
ZoomScan	<u>5x5x7, dx=8mm dy=8mm</u> <u>dz=5mm, Complete/ndx=8mm dy=8mm, h=</u> <u>5.00 mm</u>
Phantom	<u>Left head</u>
Device Position	<u>Cheek</u>
Band	<u>LTE band 4(1 RB#0)</u>

SURFACE SAR



VOLUME SAR



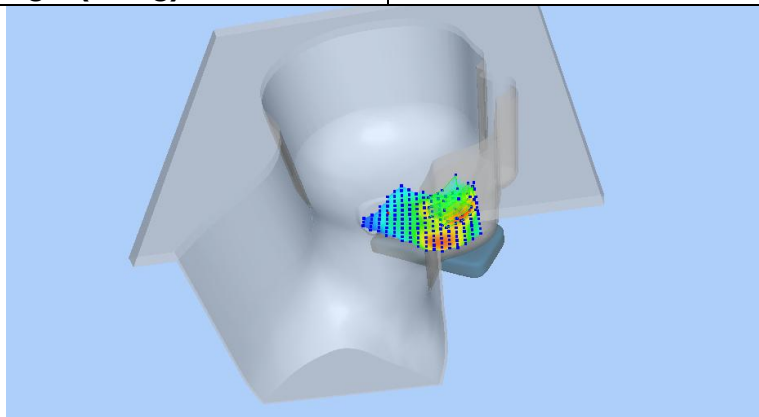
Maximum location: X=-67.00, Y=-15.00 SAR Peak: 0.51 W/kg

SAR 10g (W/Kg)

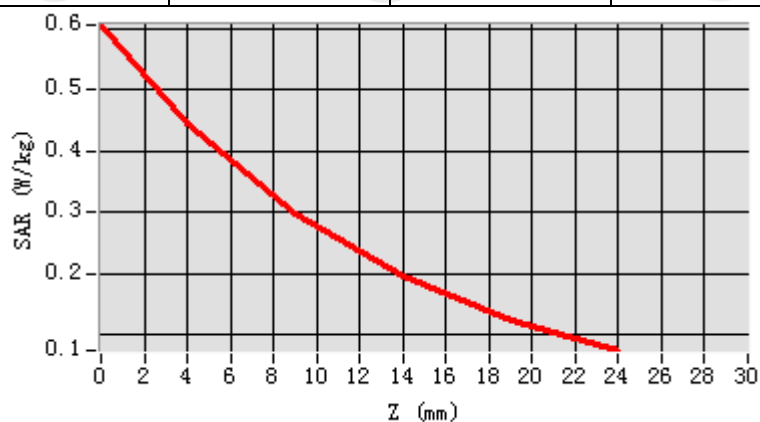
0.135173

SAR 1g (W/Kg)

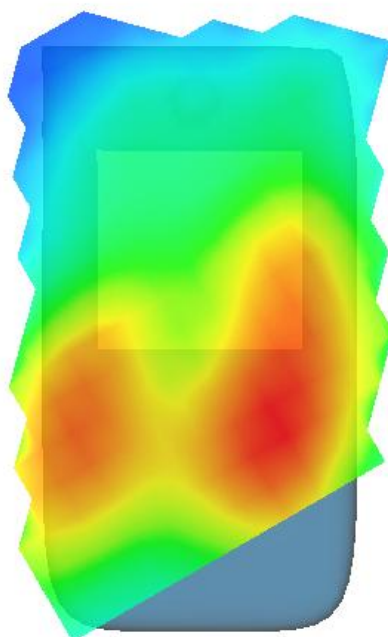
0.273018



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.6064	0.4440	0.2912	0.1923	0.1315



Hot spot position



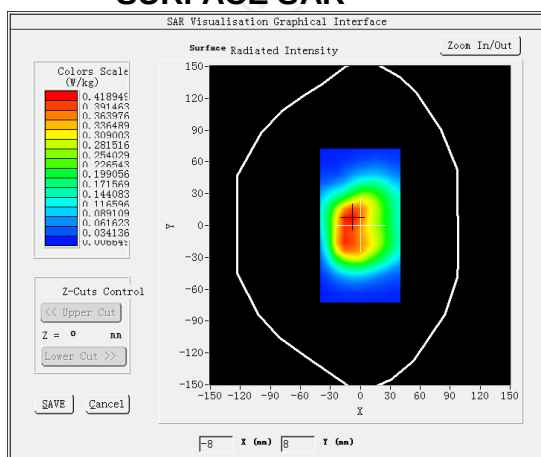
MEASUREMENT 2

Low Band SAR (Channel 20050):

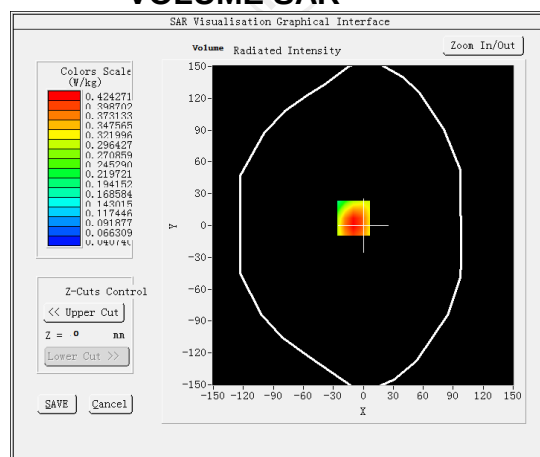
Date: 05/22/2024

Frequency (MHz)	1720.000000
Relative permittivity (real part)	40.115910
Relative permittivity (imaginary part)	14.136136
Conductivity (S/m)	1.360603
Variation (%)	0.760000
Crest Factor	1.0
Probe Conversion factor	2.08
E-Field Probe:	SSE2 (SN 25/22 EPG0375)
Area Scan	<u>dx=8mm dy=8mm, h= 5.00 mm</u>
ZoomScan	<u>5x5x7,dx=8mm dy=8mm</u> <u>dz=5mm,Complete/ndx=8mm dy=8mm, h=</u> <u>5.00 mm</u>
Phantom	<u>Validation plane</u>
Device Position	<u>Body back(10mm)</u>
Band	<u>LTE band 4(1 RB#0)</u>

SURFACE SAR

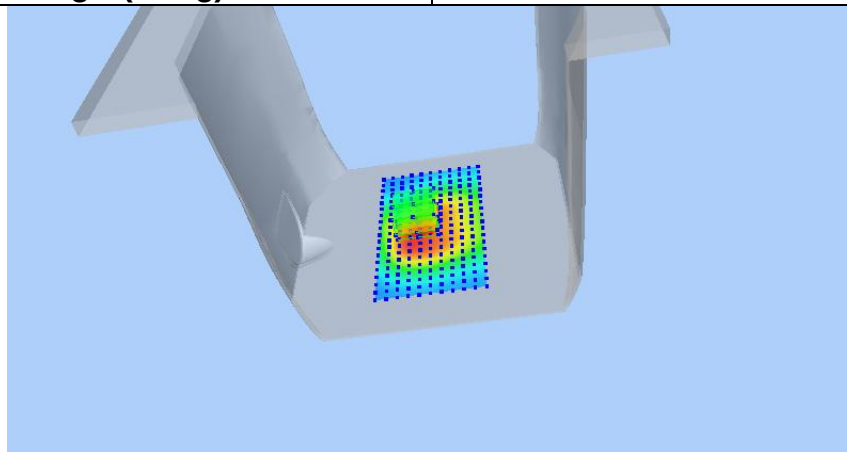


VOLUME SAR

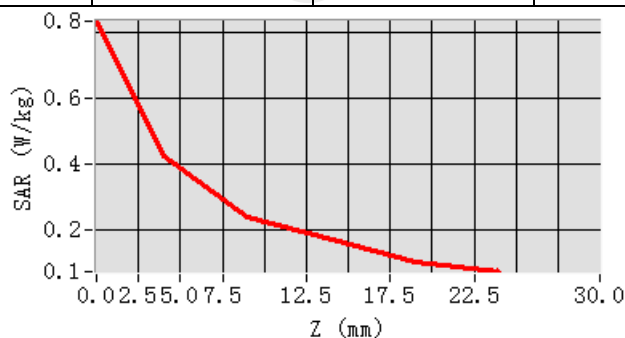


Maximum location: X=-10.00, Y=7.00 SAR Peak: 0.61 W/kg

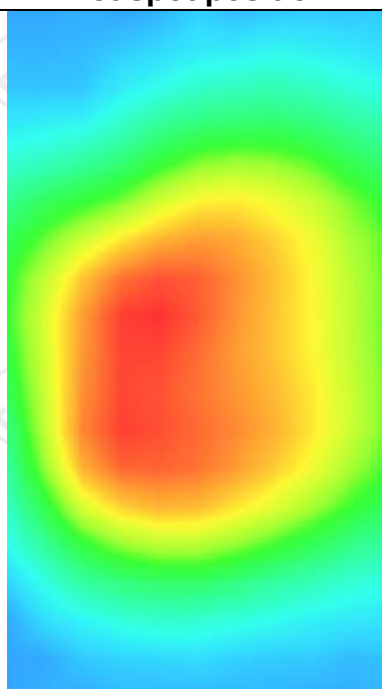
SAR 10g (W/Kg)	0.156541
SAR 1g (W/Kg)	0.320317



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.8348	0.4243	0.2386	0.1714	0.1047



Hot spot position



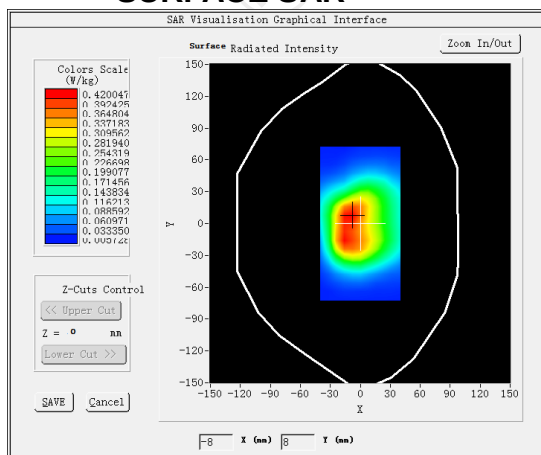
MEASUREMENT 3

Low Band SAR (Channel 20050):

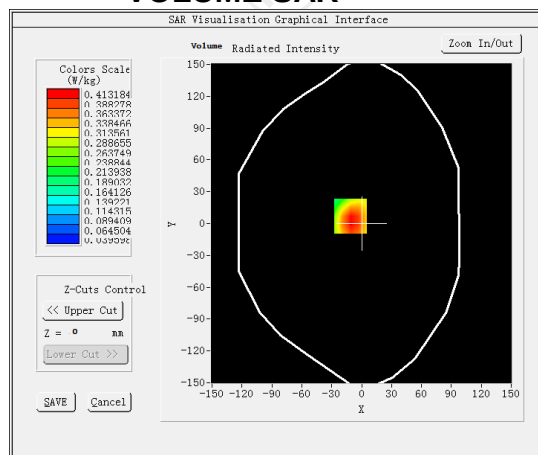
Date: 05/22/2024

Frequency (MHz)	1720.000000
Relative permittivity (real part)	40.115910
Relative permittivity (imaginary part)	14.136136
Conductivity (S/m)	1.360603
Variation (%)	-0.160000
Crest Factor	1.0
Probe Conversion factor	2.08
E-Field Probe:	SSE2 (SN 25/22 EPG0375)
Area Scan	<u>dx=8mm dy=8mm, h= 5.00 mm</u>
ZoomScan	<u>5x5x7, dx=8mm dy=8mm</u> <u>dz=5mm, Complete/ndx=8mm dy=8mm, h=</u> <u>5.00 mm</u>
Phantom	Validation plane
Device Position	<u>Body back(hotspot 10mm)</u>
Band	<u>LTE band 4(1 RB#0)</u>

SURFACE SAR



VOLUME SAR



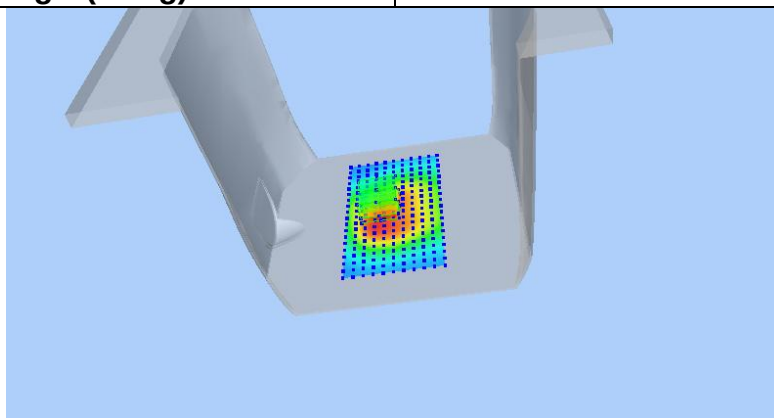
Maximum location: X=-11.00, Y=7.00 SAR Peak: 0.59 W/kg

SAR 10g (W/Kg)

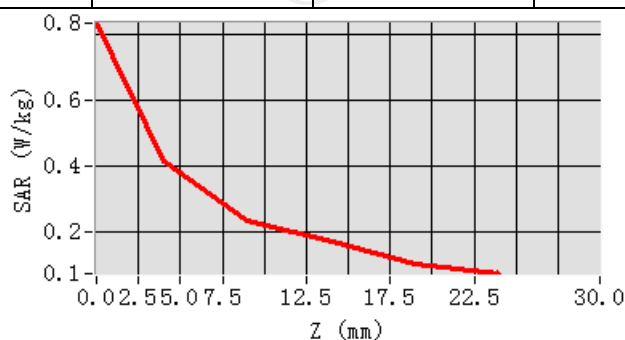
0.150217

SAR 1g (W/Kg)

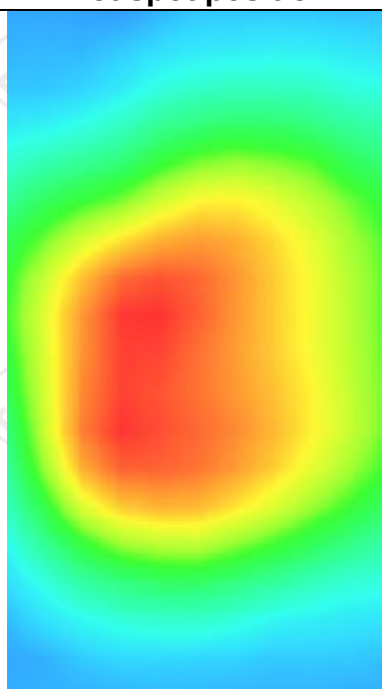
0.315741



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.8360	0.4132	0.2322	0.1706	0.1030



Hot spot position



LTE Band 5

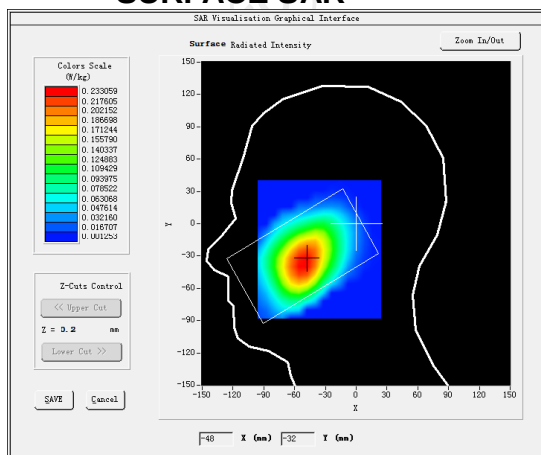
MEASUREMENT 1

Low Band SAR (Channel 20450):

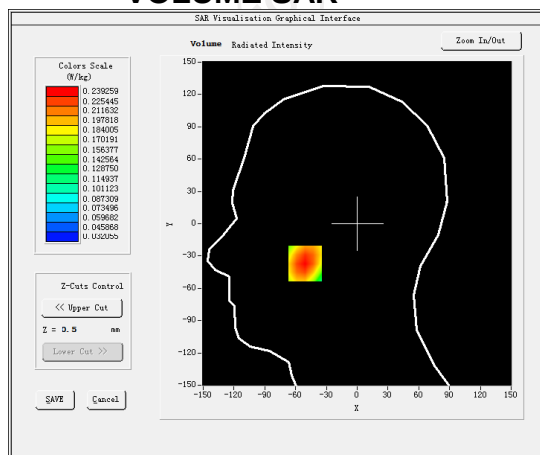
Date: 05/20/2024

Frequency (MHz)	829.000000
Relative permittivity (real part)	41.500000
Relative permittivity (imaginary part)	19.400000
Conductivity (S/m)	0.901561
Variation (%)	-1.360000
Crest Factor	1.0
Probe Conversion factor	1.80
E-Field Probe:	SSE2 (SN 25/22 EPG0375)
Area Scan	<u>dx=8mm dy=8mm, h= 5.00 mm</u>
ZoomScan	<u>5x5x7, dx=8mm dy=8mm</u> <u>dz=5mm, Complete/ndx=8mm dy=8mm, h=</u> <u>5.00 mm</u>
Phantom	<u>Left head</u>
Device Position	<u>Cheek</u>
Band	<u>LTE band 5(1 RB#0)</u>

SURFACE SAR



VOLUME SAR



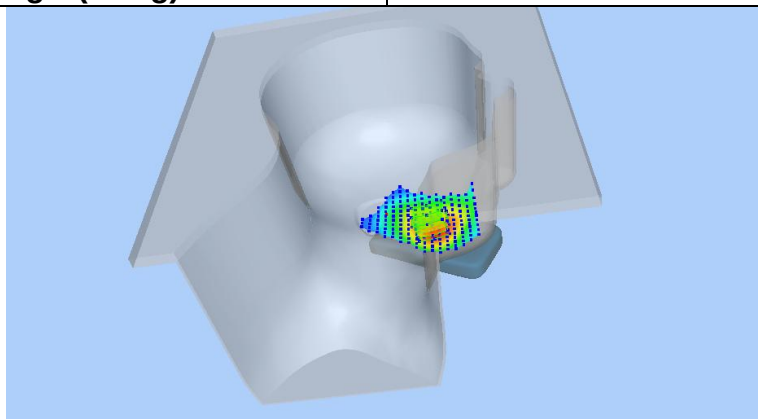
Maximum location: X=-51.00, Y=-37.00 SAR Peak: 0.29 W/kg

SAR 10g (W/Kg)

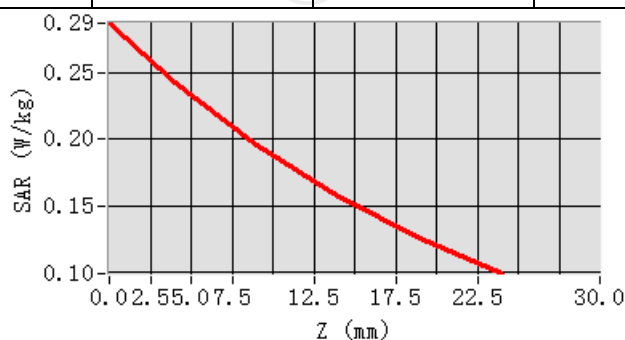
0.084167

SAR 1g (W/Kg)

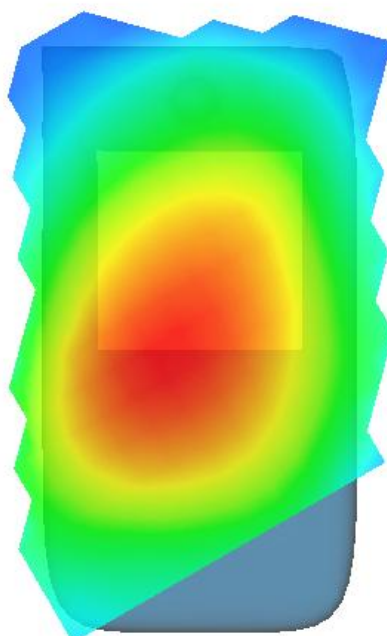
0.135174



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.2870	0.2421	0.1950	0.1568	0.1256



Hot spot position



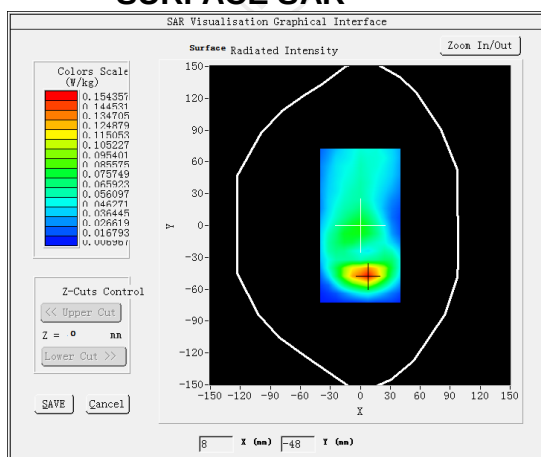
MEASUREMENT 2

Low Band SAR (Channel 20450):

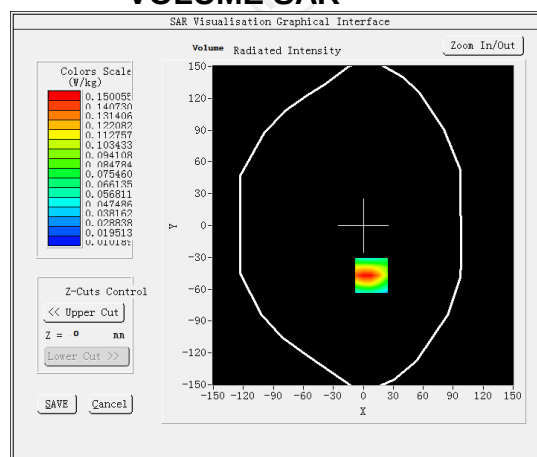
Date: 05/20/2024

Frequency (MHz)	829.000000
Relative permittivity (real part)	41.500000
Relative permittivity (imaginary part)	19.400000
Conductivity (S/m)	0.901561
Variation (%)	0.150000
Crest Factor	1.0
Probe Conversion factor	1.80
E-Field Probe:	SSE2 (SN 25/22 EPG0375)
Area Scan	<u>dx=8mm dy=8mm, h= 5.00 mm</u>
ZoomScan	<u>5x5x7,dx=8mm dy=8mm</u> <u>dz=5mm,Complete/ndx=8mm dy=8mm, h=</u> <u>5.00 mm</u>
Phantom	<u>Validation plane</u>
Device Position	<u>Body back(10mm)</u>
Band	<u>LTE band 5(1 RB#0)</u>

SURFACE SAR

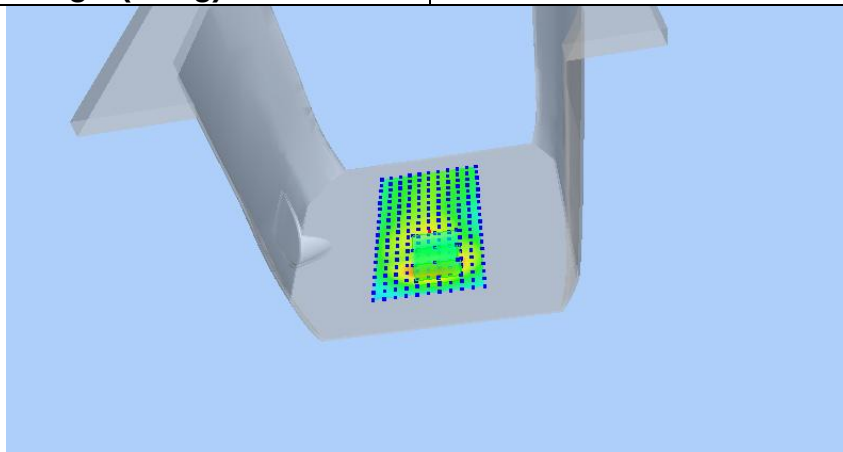


VOLUME SAR

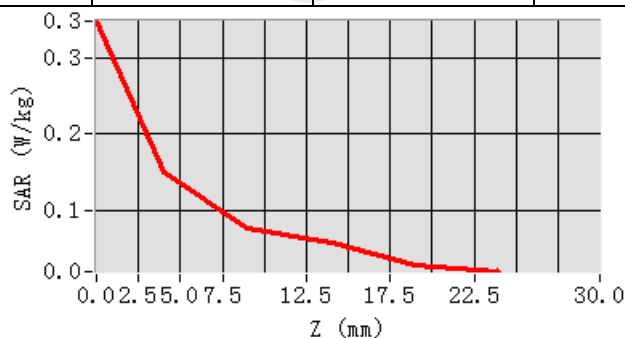


Maximum location: X=8.00, Y=-47.00 SAR Peak: 0.22 W/kg

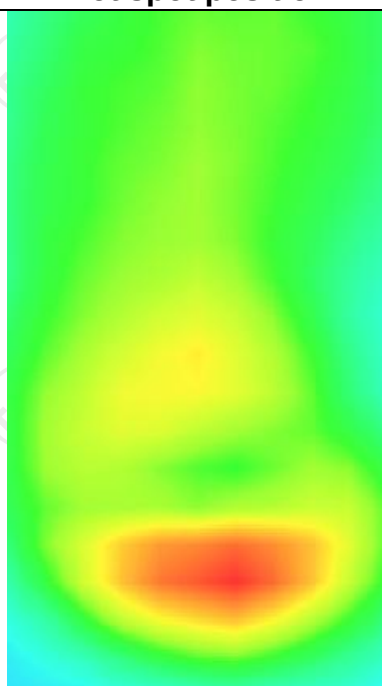
SAR 10g (W/Kg)	0.062064
SAR 1g (W/Kg)	0.118742



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.3494	0.1501	0.0758	0.0560	0.0275



Hot spot position



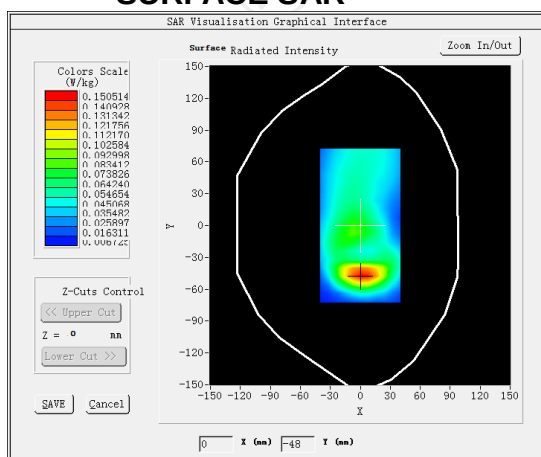
MEASUREMENT 3

Low Band SAR (Channel 20450):

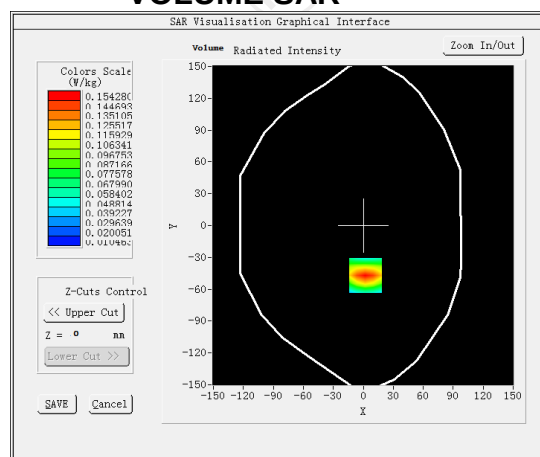
Date: 05/20/2024

Frequency (MHz)	829.000000
Relative permittivity (real part)	41.500000
Relative permittivity (imaginary part)	19.400000
Conductivity (S/m)	0.901561
Variation (%)	-1.680000
Crest Factor	1.0
Probe Conversion factor	1.80
E-Field Probe:	SSE2 (SN 25/22 EPG0375)
Area Scan	<u>dx=8mm dy=8mm, h= 5.00 mm</u>
ZoomScan	<u>5x5x7, dx=8mm dy=8mm</u> <u>dz=5mm, Complete/ndx=8mm dy=8mm, h=</u> <u>5.00 mm</u>
Phantom	<u>Validation plane</u>
Device Position	<u>Body back((hotspot 10mm)</u>
Band	<u>LTE band 5(1 RB#0)</u>

SURFACE SAR

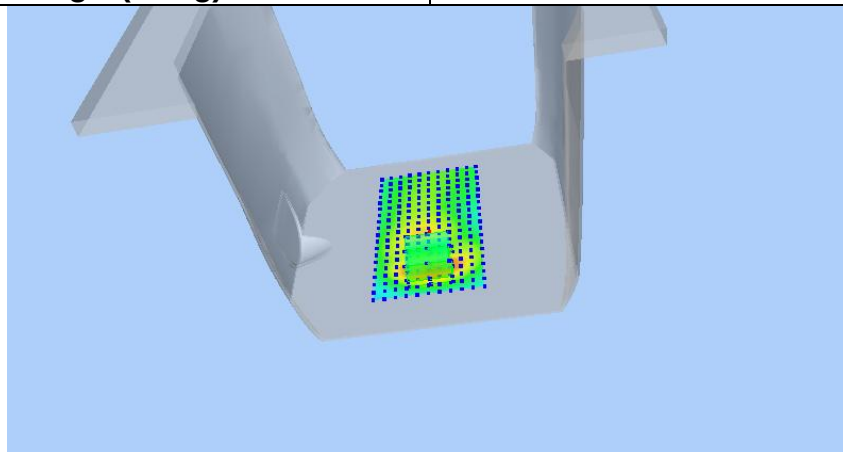


VOLUME SAR

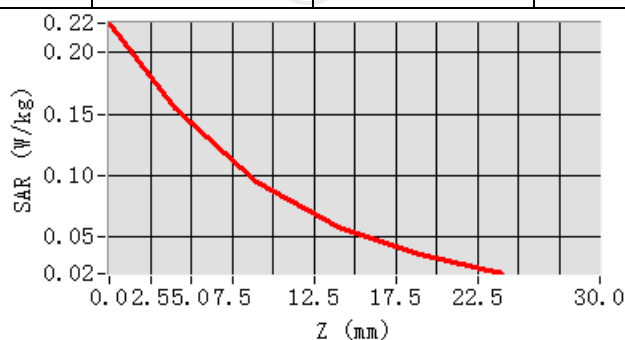


Maximum location: X=2.00, Y=-47.00 SAR Peak: 0.22 W/kg

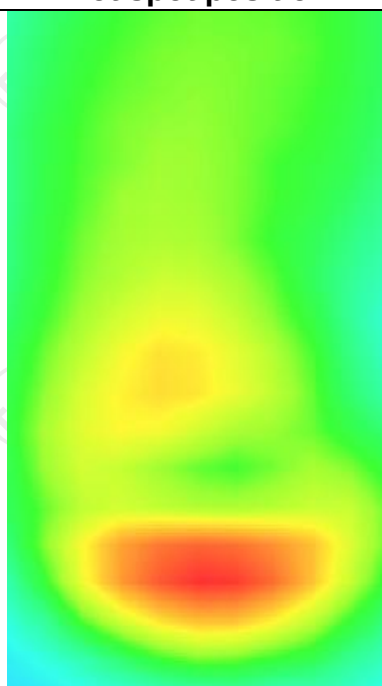
SAR 10g (W/Kg)	0.071205
SAR 1g (W/Kg)	0.116204



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.2234	0.1543	0.0952	0.0583	0.0358



Hot spot position



LTE Band 12

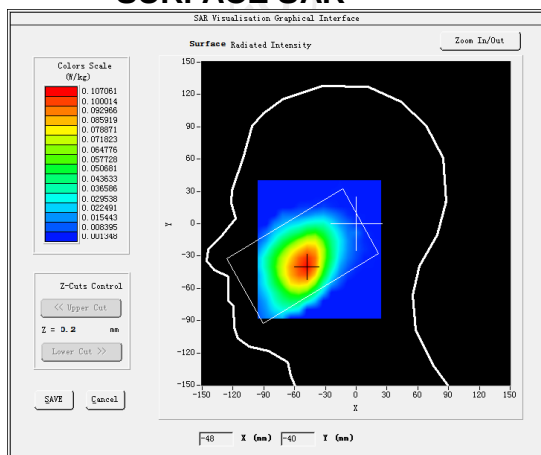
MEASUREMENT 1

Middle Band SAR (Channel 23130):

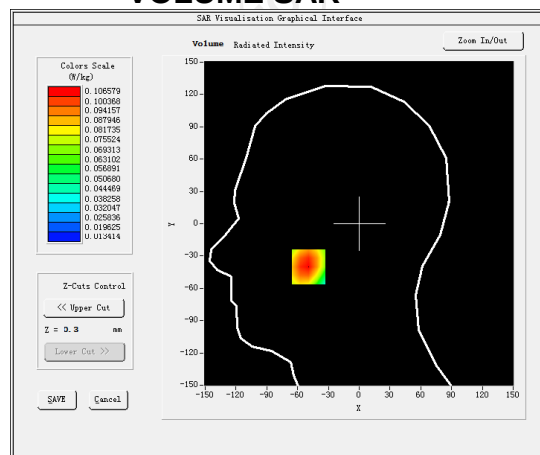
Date: 05/13/2024

Frequency (MHz)	704.000000
Relative permittivity (real part)	42.126667
Relative permittivity (imaginary) part)	23.264000
Conductivity (S/m)	0.914404
Variation (%)	1.590000
Crest Factor	1.0
Probe Conversion factor	1.71
E-Field Probe:	SSE2 (SN 25/22 EPG0375)
Area Scan	<u>dx=8mm dy=8mm, h= 5.00 mm</u>
ZoomScan	<u>5x5x7, dx=8mm dy=8mm</u> <u>dz=5mm, Complete/ndx=8mm dy=8mm, h=</u> <u>5.00 mm</u>
Phantom	<u>Left head</u>
Device Position	<u>Cheek</u>
Band	<u>LTE band 12(1 RB#0)</u>

SURFACE SAR



VOLUME SAR



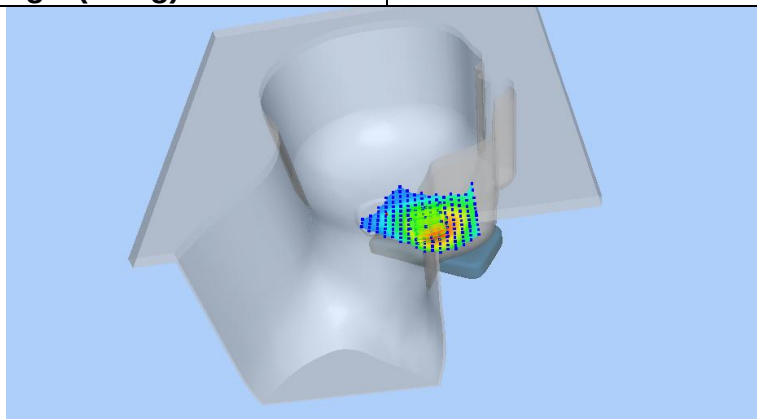
Maximum location: X=-39.00, Y=-41.00 SAR Peak: 0.19 W/kg

SAR 10g (W/Kg)

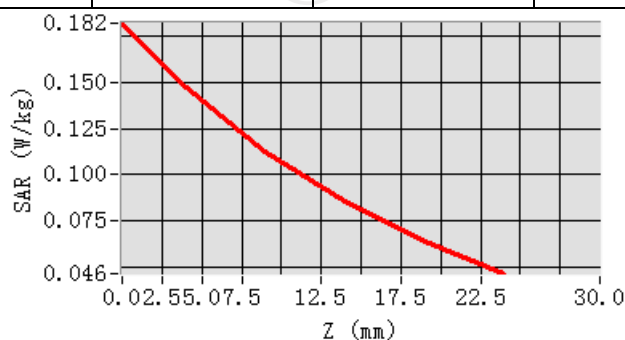
0.035748

SAR 1g (W/Kg)

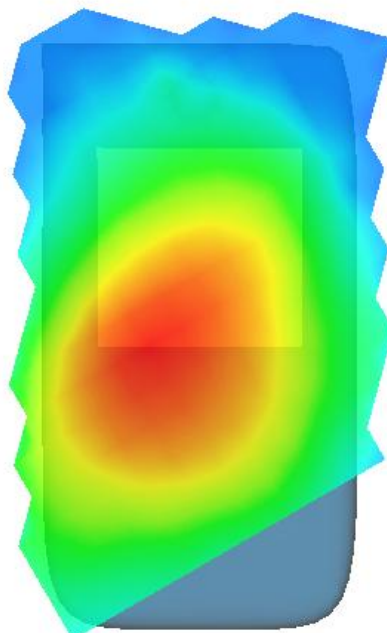
0.076218



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.1822	0.1478	0.1128	0.0854	0.0640



Hot spot position



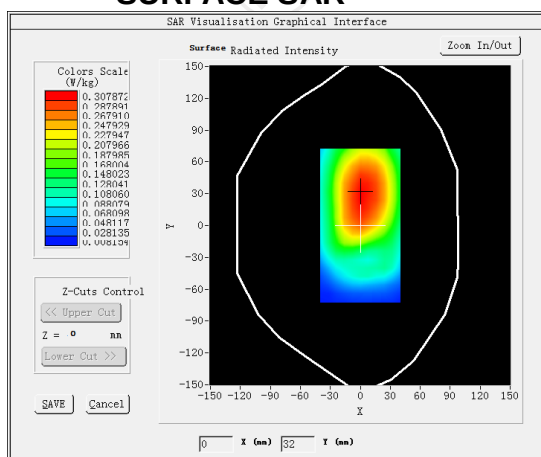
MEASUREMENT 2

Middle Band SAR (Channel 23130):

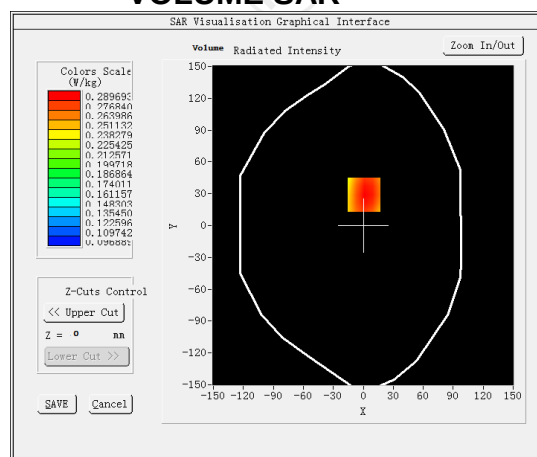
Date: 05/13/2024

Frequency (MHz)	704.000000
Relative permittivity (real part)	42.126667
Relative permittivity (imaginary part)	23.264000
Conductivity (S/m)	0.914404
Variation (%)	2.010000
Crest Factor	1.0
Probe Conversion factor	1.71
E-Field Probe:	SSE2 (SN 25/22 EPG0375)
Area Scan	<u>dx=8mm dy=8mm, h= 5.00 mm</u>
ZoomScan	<u>5x5x7, dx=8mm dy=8mm</u> <u>dz=5mm, Complete/ndx=8mm dy=8mm, h=</u> <u>5.00 mm</u>
Phantom	Validation plane
Device Position	Body back(10mm)
Band	LTE band 12(1 RB#0)

SURFACE SAR

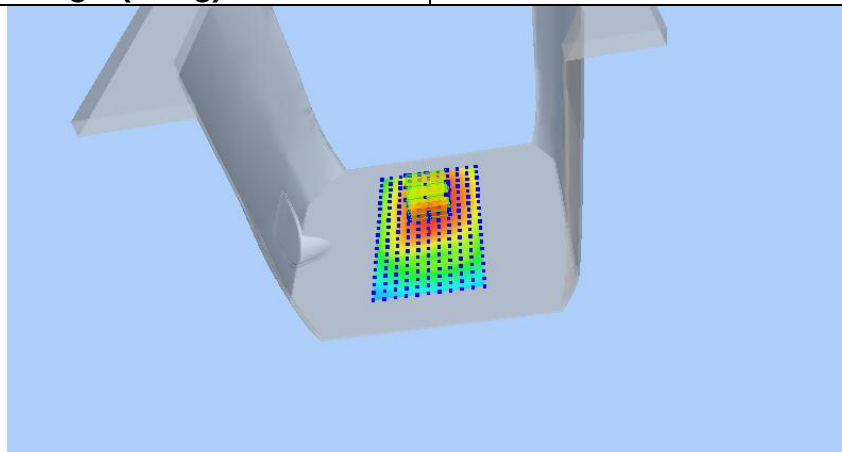


VOLUME SAR

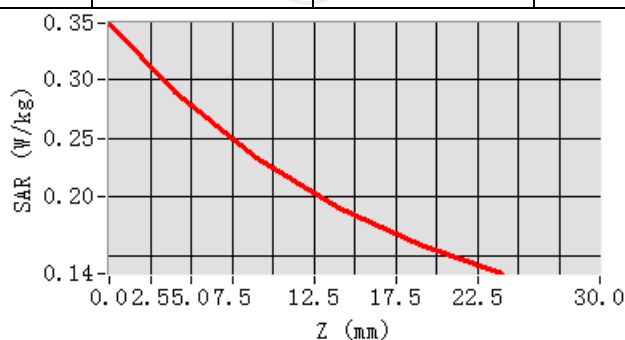


Maximum location: X=1.00, Y=29.00 SAR Peak: 0.35 W/kg

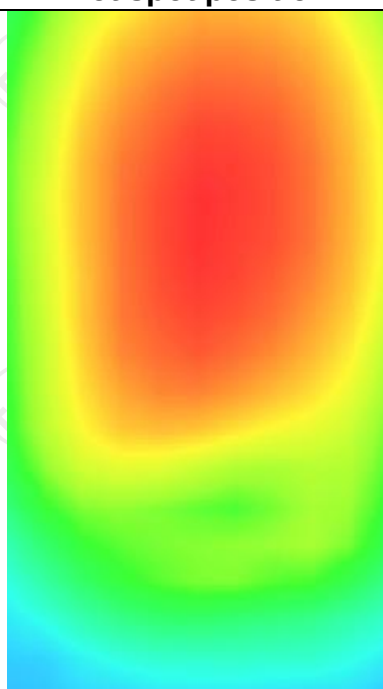
SAR 10g (W/Kg)	0.103178
SAR 1g (W/Kg)	0.142067



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.3479	0.2897	0.2328	0.1909	0.1601



Hot spot position



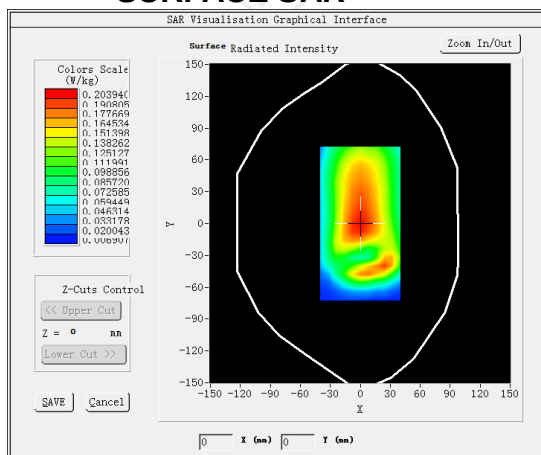
MEASUREMENT 3

Middle Band SAR (Channel 23130):

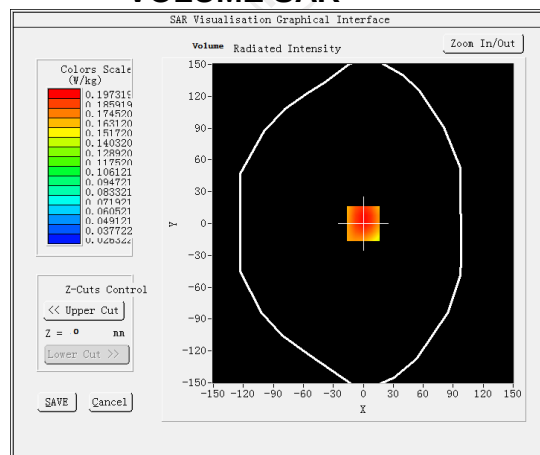
Date: 05/13/2024

Frequency (MHz)	704.000000
Relative permittivity (real part)	42.126667
Relative permittivity (imaginary part)	23.264000
Conductivity (S/m)	0.914404
Variation (%)	-1.600000
Crest Factor	1.0
Probe Conversion factor	1.71
E-Field Probe:	SSE2 (SN 25/22 EPG0375)
Area Scan	<u>dx=8mm dy=8mm, h= 5.00 mm</u>
ZoomScan	<u>5x5x7,dx=8mm dy=8mm</u> <u>dz=5mm,Complete/ndx=8mm dy=8mm, h=</u> <u>5.00 mm</u>
Phantom	Validation plane
Device Position	Body back(hotspot 10mm)
Band	LTE band 12(1 RB#0)

SURFACE SAR

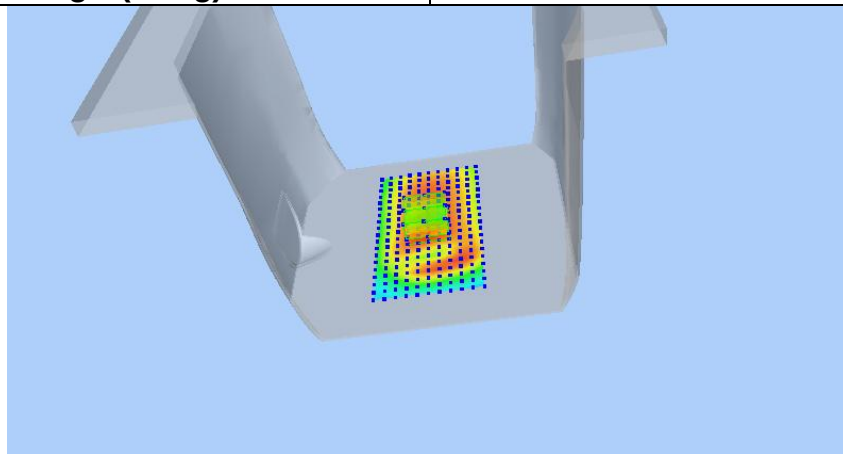


VOLUME SAR

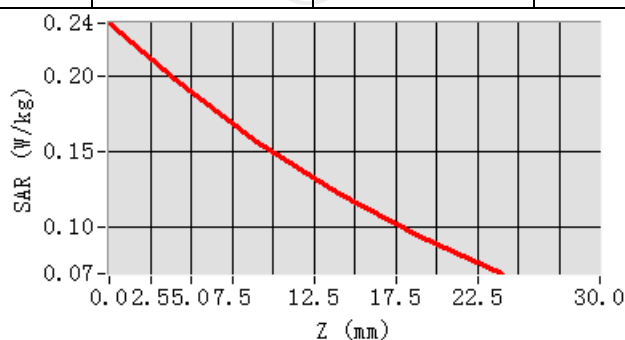


Maximum location: X=0.00, Y=0.00 SAR Peak: 0.24 W/kg

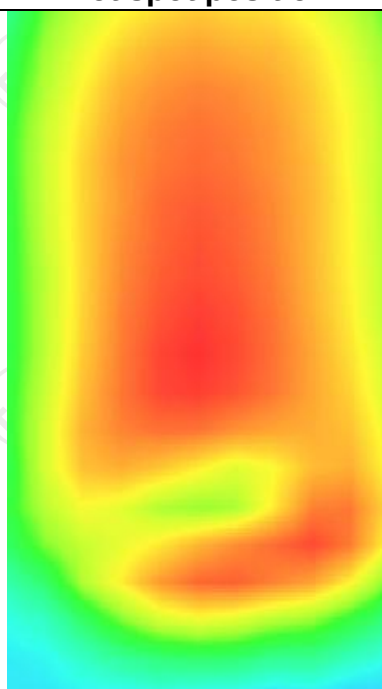
SAR 10g (W/Kg)	0.064782
SAR 1g (W/Kg)	0.106218



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.2351	0.1973	0.1565	0.1222	0.0935



Hot spot position



LTE Band 41(HPUE)

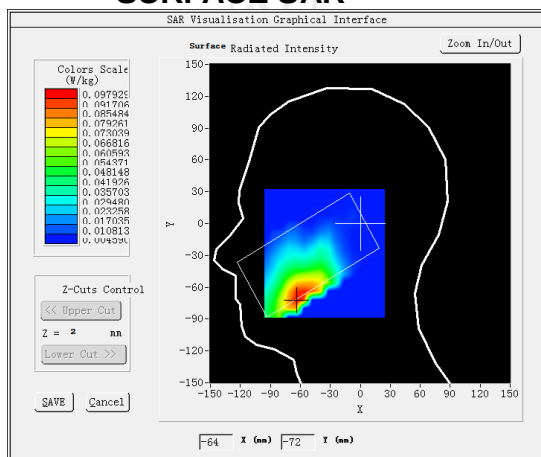
MEASUREMENT 1

Low Band SAR (Channel 39750):

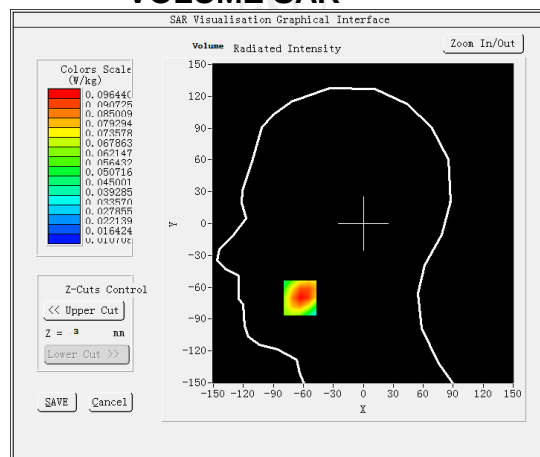
Date: 06/03/2024

Frequency (MHz)	2506.000000
Relative permittivity (real part)	39.009335
Relative permittivity (imaginary part)	13.553667
Conductivity (S/m)	1.952481
Variation (%)	-0.570000
Crest Factor	1.0
Probe Conversion factor	4.36
E-Field Probe:	SSE2 (SN 25/22 EPG0375)
Area Scan	<u>dx=12mm dy=12mm, h= 5.00 mm</u>
ZoomScan	<u>5x5x7, dx=5mm dy=5mm</u> <u>dz=5mm, Complete/ndx=8mm dy=8mm, h=</u> <u>5.00 mm</u>
Phantom	<u>Left head</u>
Device Position	<u>Cheek</u>
Band	<u>LTE band 41(1 RB#0)</u>

SURFACE SAR



VOLUME SAR



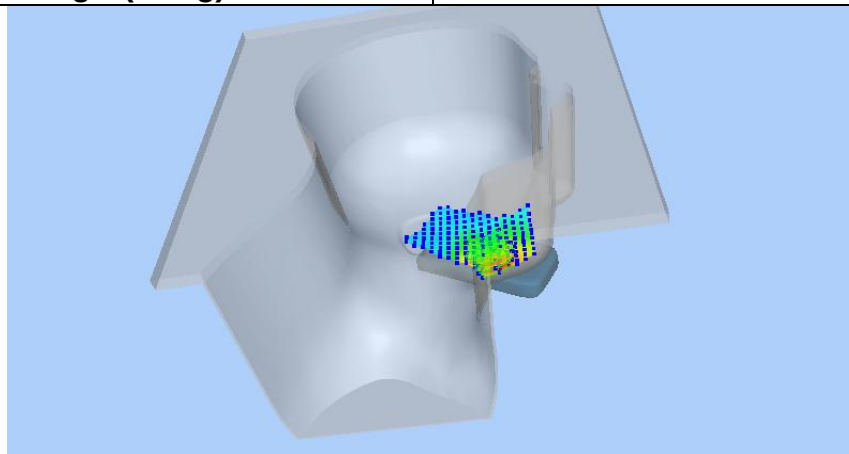
Maximum location: X=-63.00, Y=-70.00 SAR Peak: 0.14 W/kg

SAR 10g (W/Kg)

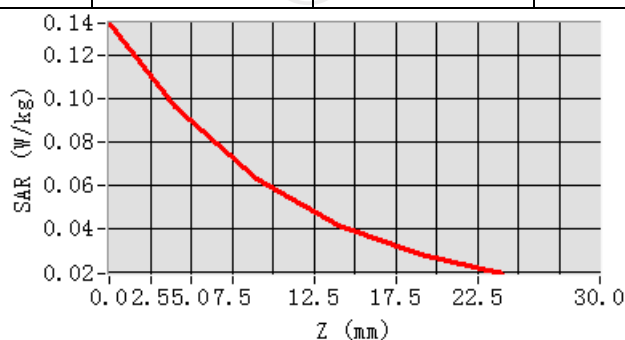
0.040037

SAR 1g (W/Kg)

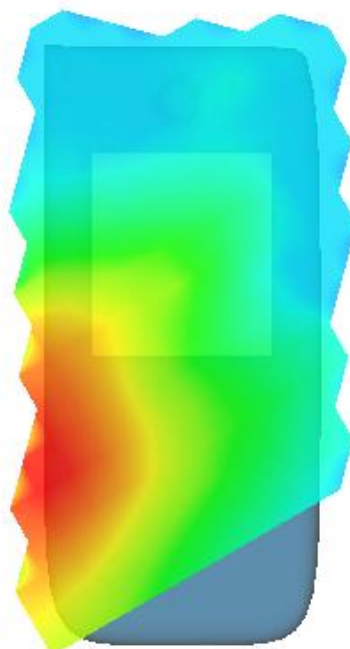
0.079120



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.1351	0.0964	0.0630	0.0418	0.0287



Hot spot position



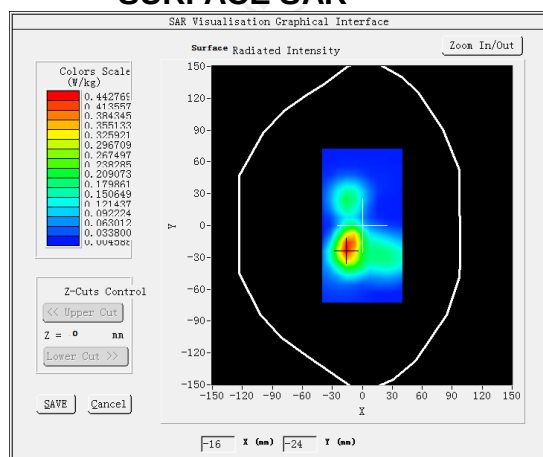
MEASUREMENT 2

Low Band SAR (Channel 39750):

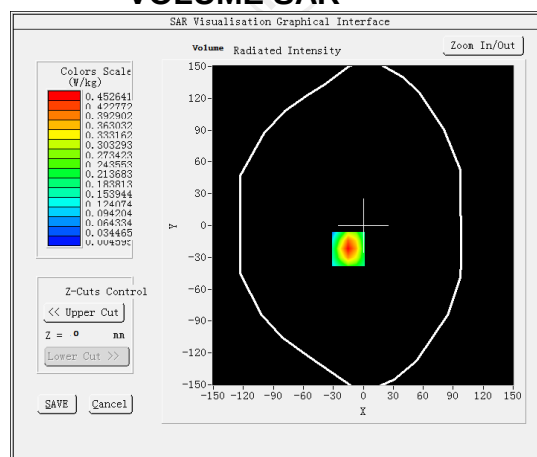
Date: 06/03/2024

Frequency (MHz)	2506.000000
Relative permittivity (real part)	39.009335
Relative permittivity (imaginary part)	13.553667
Conductivity (S/m)	1.952481
Variation (%)	-0.960000
Crest Factor	1.0
Probe Conversion factor	4.36
E-Field Probe:	SSE2 (SN 25/22 EPG0375)
Area Scan	<u>dx=12mm dy=12mm, h= 5.00 mm</u>
ZoomScan	<u>5x5x7, dx=5mm dy=5mm</u> <u>dz=5mm, Complete/ndx=8mm dy=8mm, h=</u> <u>5.00 mm</u>
Phantom	<u>Validation plane</u>
Device Position	<u>Body back (10mm)</u>
Band	<u>LTE band 41(1 RB#0)</u>

SURFACE SAR

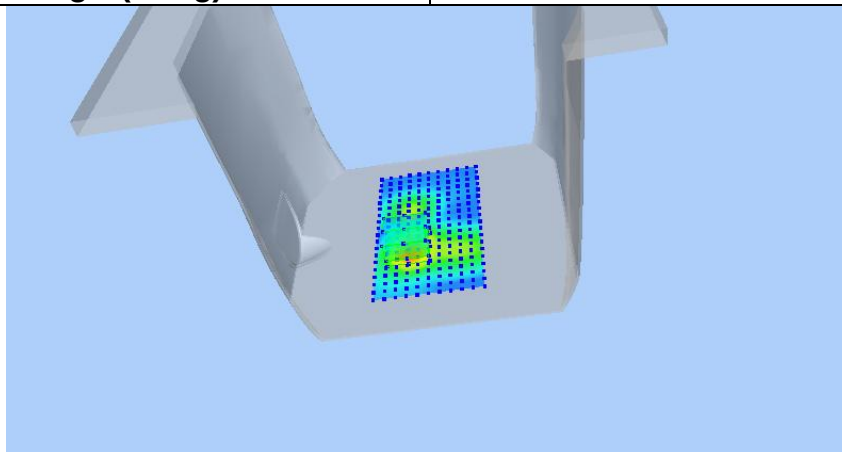


VOLUME SAR

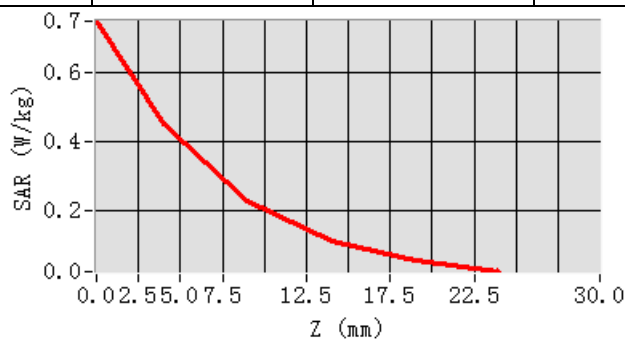


Maximum location: X=-15.00, Y=-22.00 SAR Peak: 0.75 W/kg

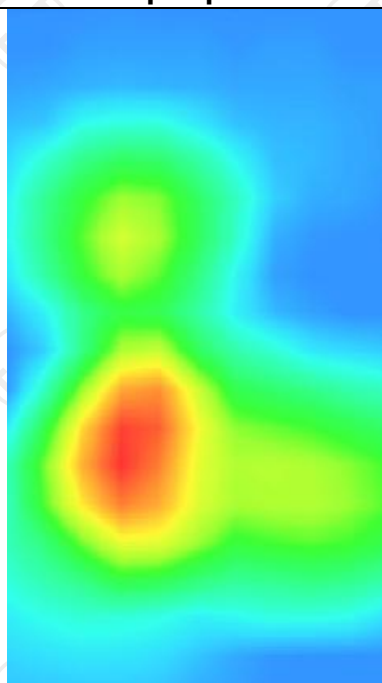
SAR 10g (W/Kg)	0.260151
SAR 1g (W/Kg)	0.384152



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.7498	0.4526	0.2287	0.1120	0.0551



Hot spot position



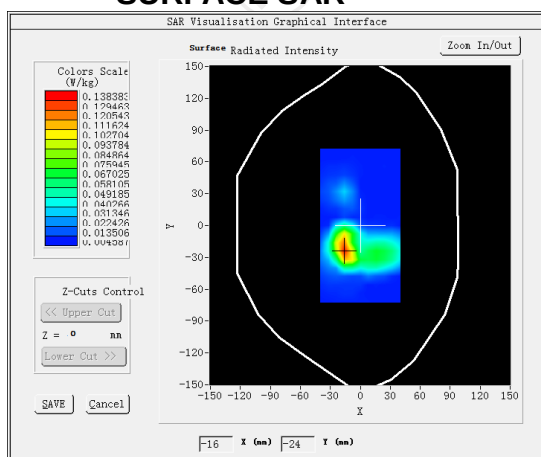
MEASUREMENT 3

Low Band SAR (Channel 39750):

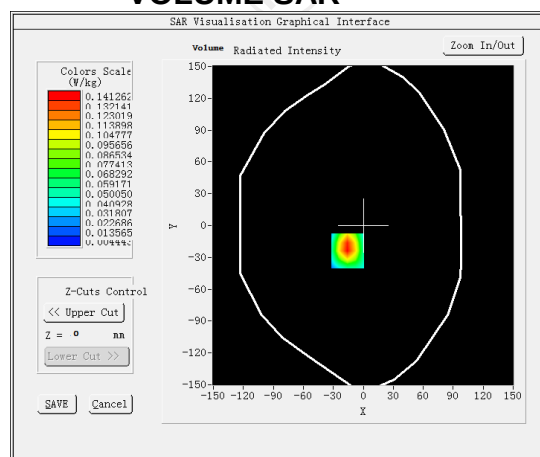
Date: 06/03/2024

Frequency (MHz)	2506.000000
Relative permittivity (real part)	39.009335
Relative permittivity (imaginary part)	13.553667
Conductivity (S/m)	1.952481
Variation (%)	0.900000
Crest Factor	1.0
Probe Conversion factor	4.36
E-Field Probe:	SSE2 (SN 25/22 EPG0375)
Area Scan	<u>dx=12mm dy=12mm, h= 5.00 mm</u>
ZoomScan	<u>5x5x7, dx=5mm dy=5mm</u> <u>dz=5mm, Complete/ndx=8mm dy=8mm, h=</u> <u>5.00 mm</u>
Phantom	Validation plane
Device Position	Body back (hotspot 10mm)
Band	LTE band 41(1 RB#0)

SURFACE SAR

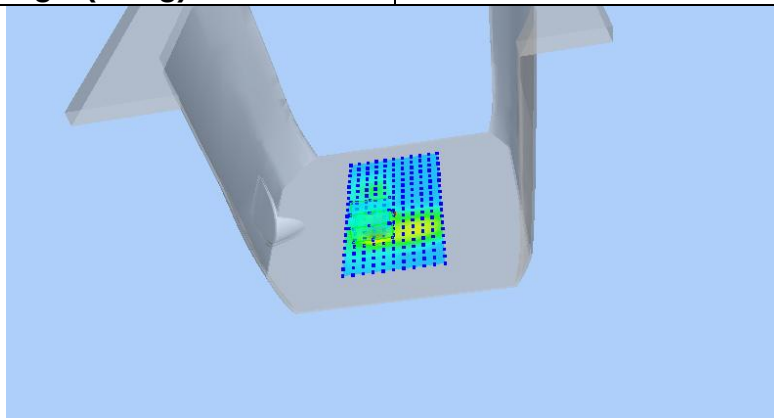


VOLUME SAR

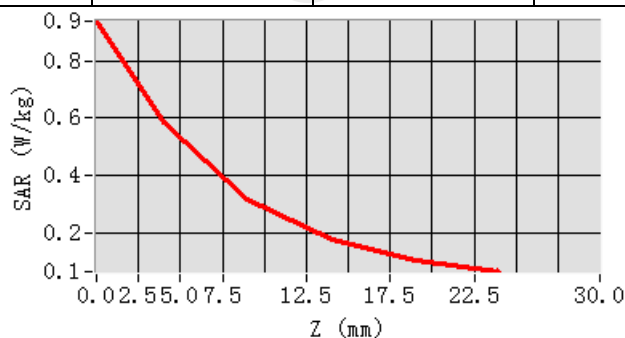


Maximum location: X=-16.00, Y=-24.00 SAR Peak: 0.94 W/kg

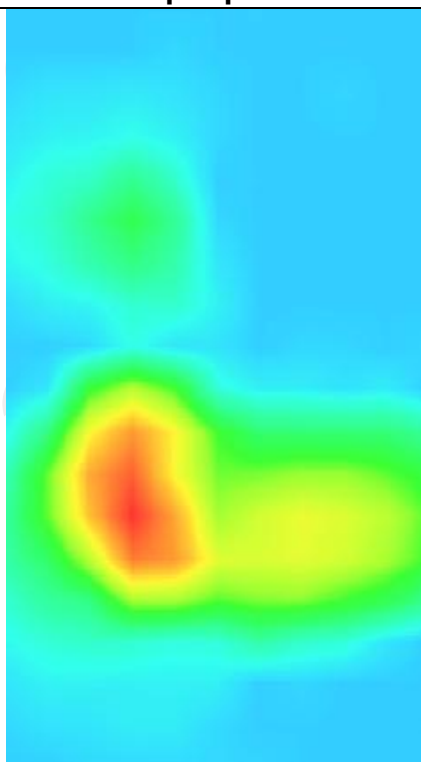
SAR 10g (W/Kg)	0.320617
SAR 1g (W/Kg)	0.516273



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.9365	0.5845	0.3170	0.1765	0.1073



Hot spot position



LTE Band 66

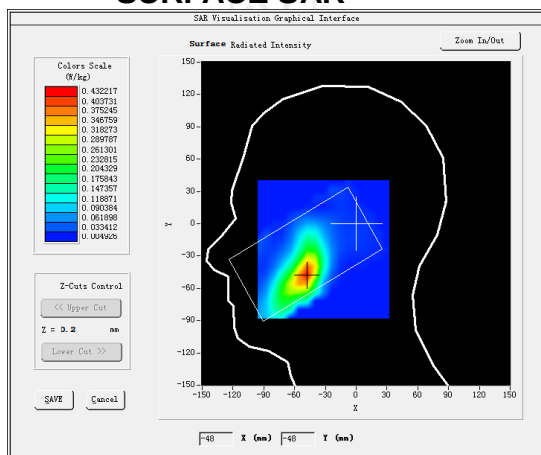
MEASUREMENT 1

Middle Band SAR (Channel 132322):

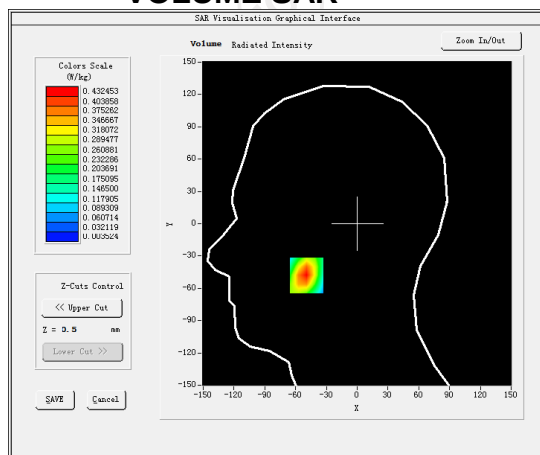
Date: 05/22/2024

Frequency (MHz)	1720.000000
Relative permittivity (real part)	40.115910
Relative permittivity (imaginary part)	14.136136
Conductivity (S/m)	1.360603
Variation (%)	0.570000
Crest Factor	1.0
Probe Conversion factor	4.36
E-Field Probe:	SSE2 (SN 25/22 EPG0375)
Area Scan	<u>dx=8mm dy=8mm, h= 5.00 mm</u>
ZoomScan	<u>5x5x7, dx=8mm dy=8mm</u> <u>dz=5mm, Complete/ndx=8mm dy=8mm, h=</u> <u>5.00 mm</u>
Phantom	<u>Left head</u>
Device Position	<u>Cheek</u>
Band	<u>LTE band 66(1 RB#0)</u>

SURFACE SAR



VOLUME SAR



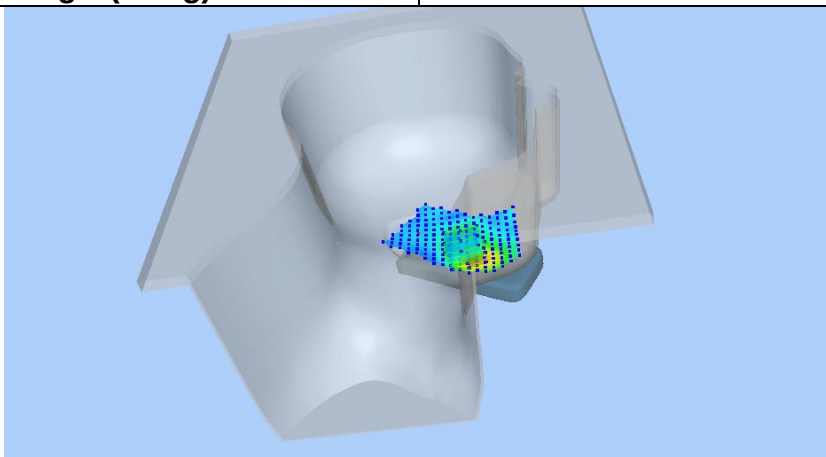
Maximum location: X=-49.00, Y=-48.00 SAR Peak: 0.22 W/kg

SAR 10g (W/Kg)

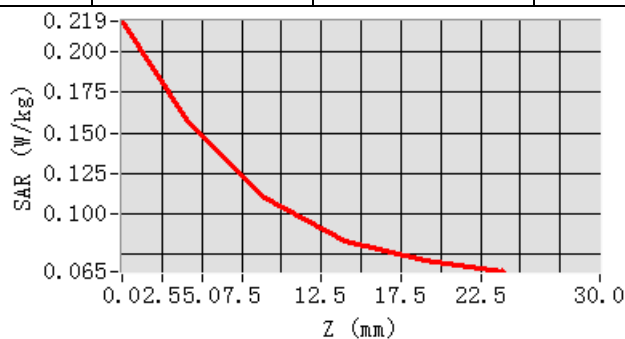
0.062509

SAR 1g (W/Kg)

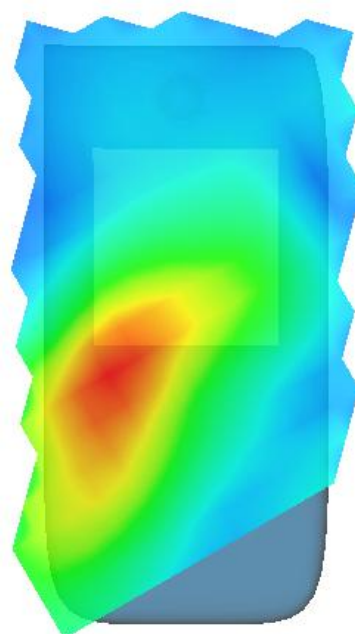
0.120317



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.2187	0.1588	0.1102	0.0836	0.0711



Hot spot position



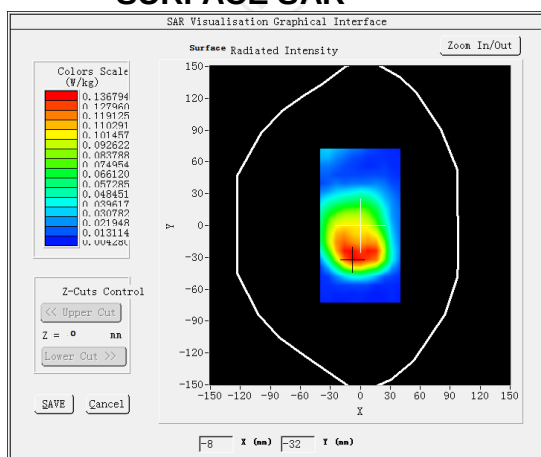
MEASUREMENT 2

Low Band SAR (Channel 132072):

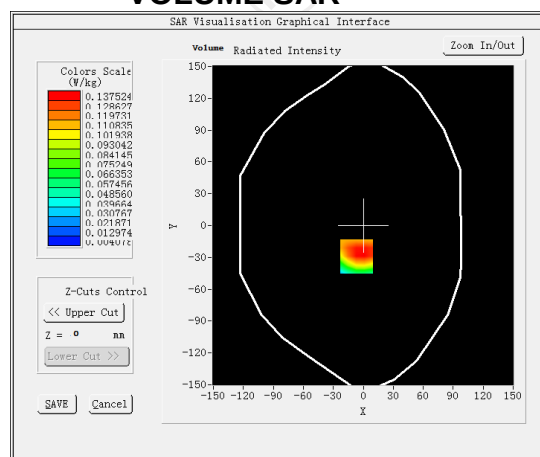
Date: 05/22/2024

Frequency (MHz)	1720.000000
Relative permittivity (real part)	40.115910
Relative permittivity (imaginary part)	14.136136
Conductivity (S/m)	1.360603
Variation (%)	-4.810000
Crest Factor	1.0
Probe Conversion factor	4.36
E-Field Probe:	SSE2 (SN 25/22 EPG0375)
Area Scan	<u>dx=8mm dy=8mm, h= 5.00 mm</u>
ZoomScan	<u>5x5x7,dx=8mm dy=8mm</u> <u>dz=5mm,Complete/ndx=8mm dy=8mm, h=</u> <u>5.00 mm</u>
Phantom	<u>Validation plane</u>
Device Position	<u>Body back(10mm)</u>
Band	<u>LTE band 66(1 RB#0)</u>

SURFACE SAR

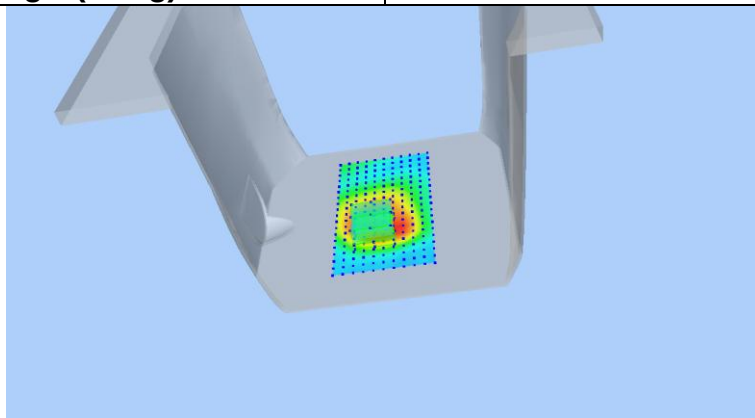


VOLUME SAR

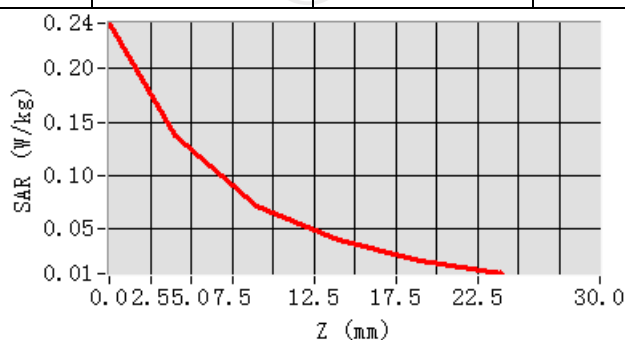


Maximum location: X=-7.00, Y=-29.00 SAR Peak: 0.22W/kg

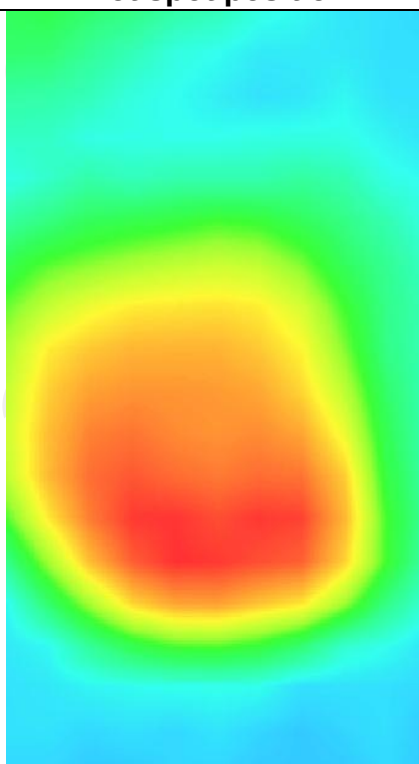
SAR 10g (W/Kg)	0.075422
SAR 1g (W/Kg)	0.134453



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.2429	0.1375	0.0706	0.0387	0.0194



Hot spot position



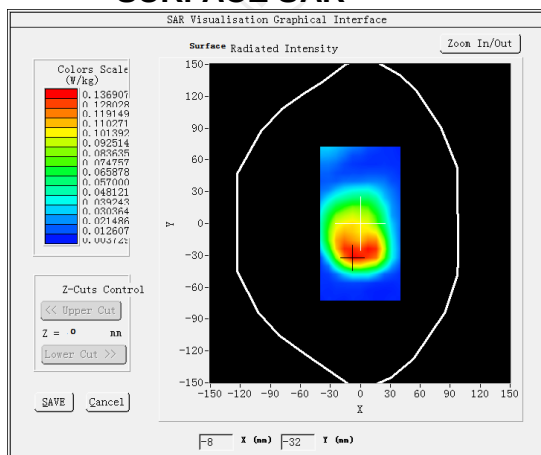
MEASUREMENT 3

Low Band SAR (Channel 132072):

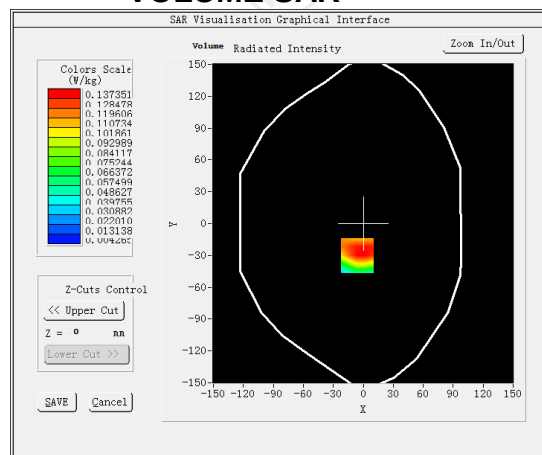
Date: 05/22/2024

Frequency (MHz)	1720.000000
Relative permittivity (real part)	40.115910
Relative permittivity (imaginary part)	14.136136
Conductivity (S/m)	1.360603
Variation (%)	-3.150000
Crest Factor	1.0
Probe Conversion factor	4.36
E-Field Probe:	SSE2 (SN 25/22 EPG0375)
Area Scan	<u>dx=8mm dy=8mm, h= 5.00 mm</u>
ZoomScan	<u>5x5x7,dx=8mm dy=8mm</u> <u>dz=5mm,Complete/ndx=8mm dy=8mm, h=</u> <u>5.00 mm</u>
Phantom	Validation plane
Device Position	Body back((hotspot10mm)
Band	<u>LTE band 66(1 RB#0)</u>

SURFACE SAR

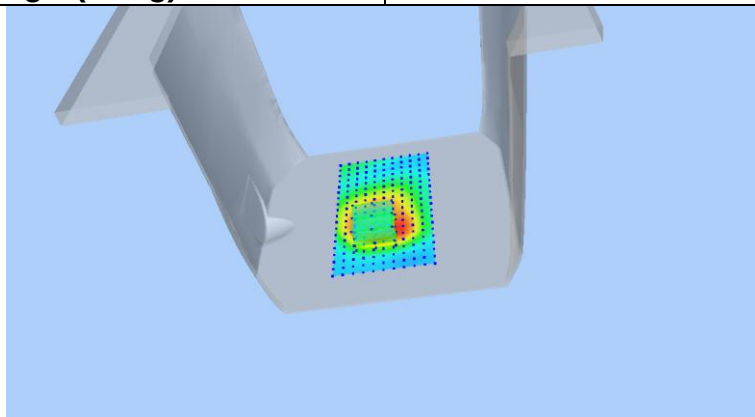


VOLUME SAR

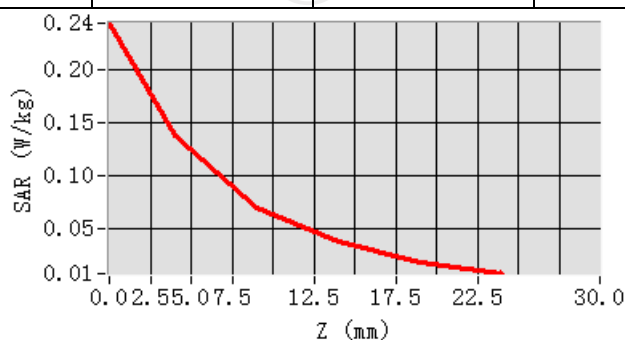


Maximum location: X=-6.00, Y=-30.00 SAR Peak: 0.23 W/kg

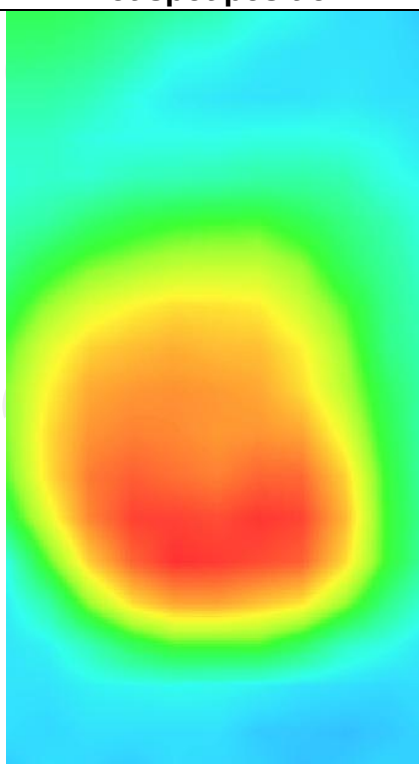
SAR 10g (W/Kg)	0.076238
SAR 1g (W/Kg)	0.135267



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.2430	0.1374	0.0707	0.0387	0.0191



Hot spot position



LTE Band 71

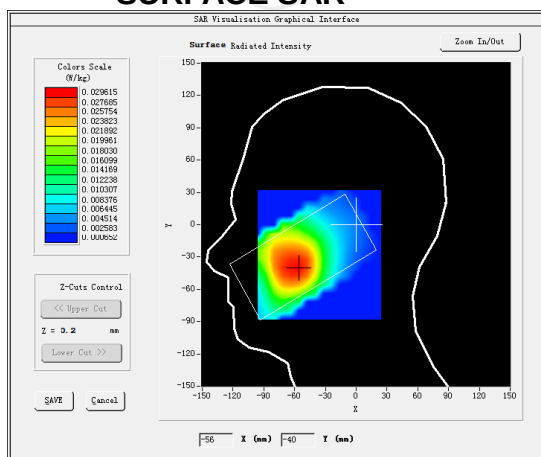
MEASUREMENT 1

Low Band SAR (Channel 133322):

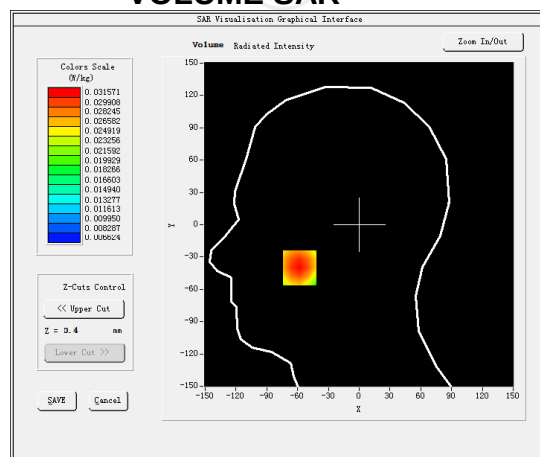
Date: 05/13/2024

Frequency (MHz)	673.000000
Relative permittivity (real part)	41.432976
Relative permittivity (imaginary part)	12.468860
Conductivity (S/m)	0.862835
Variation (%)	-1.630000
Crest Factor	1.0
Probe Conversion factor	1.71
E-Field Probe:	SSE2 (SN 25/22 EPGO375)
Area Scan	<u>dx=8mm dy=8mm, h= 5.00 mm</u>
ZoomScan	<u>5x5x7, dx=8mm dy=8mm</u> <u>dz=5mm, Complete/ndx=8mm dy=8mm, h=</u> <u>5.00 mm</u>
Phantom	<u>Left head</u>
Device Position	<u>Cheek</u>
Band	<u>LTE band 71(1 RB#0)</u>

SURFACE SAR



VOLUME SAR



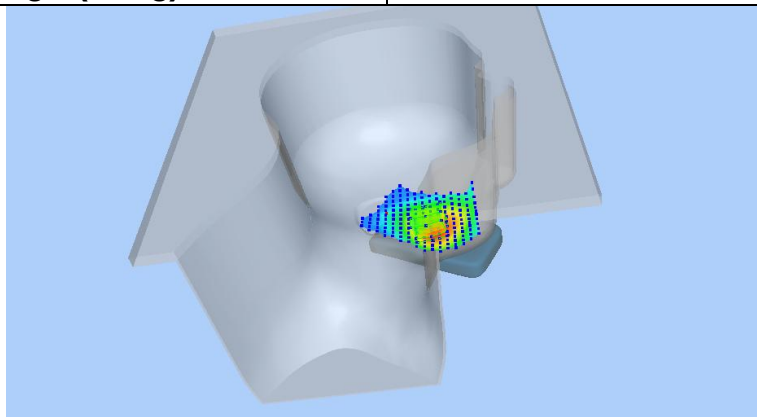
Maximum location: X=-49.00, Y=-40.00 SAR Peak: 0.16 W/kg

SAR 10g (W/Kg)

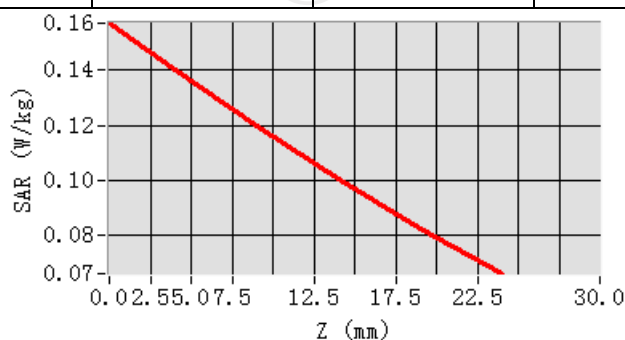
0.043061

SAR 1g (W/Kg)

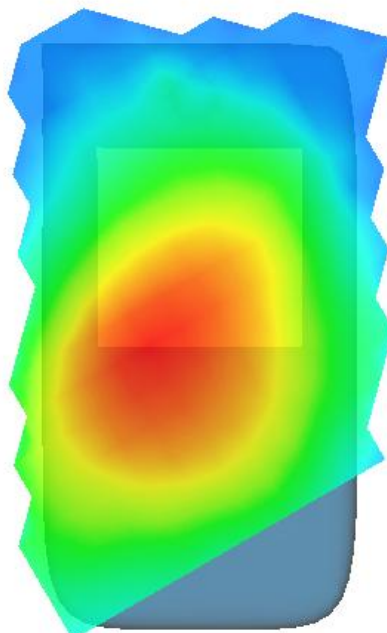
0.084120



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.1572	0.1401	0.1196	0.1003	0.0824



Hot spot position



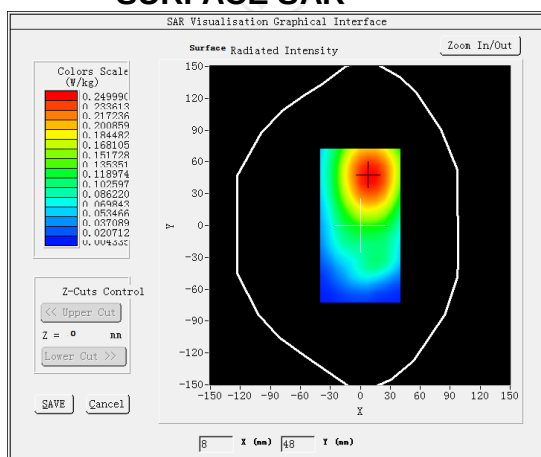
MEASUREMENT 2

Low Band SAR (Channel 133322):

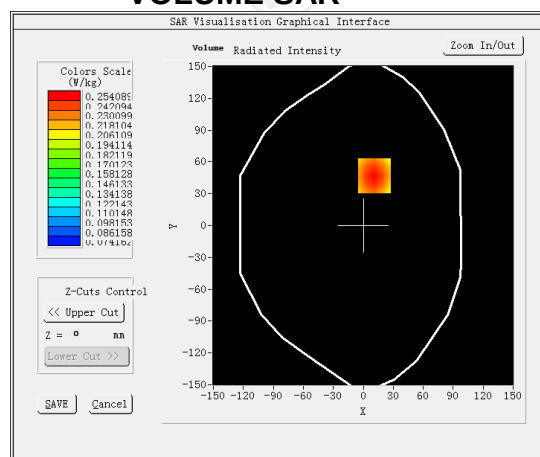
Date: 05/13/2024

Frequency (MHz)	673.000000
Relative permittivity (real part)	41.432976
Relative permittivity (imaginary part)	12.468860
Conductivity (S/m)	0.862835
Variation (%)	-2.740000
Crest Factor	1.0
Probe Conversion factor	1.71
E-Field Probe:	SSE2 (SN 25/22 EPG0375)
Area Scan	<u>dx=8mm dy=8mm, h= 5.00 mm</u>
ZoomScan	<u>5x5x7, dx=8mm dy=8mm</u> <u>dz=5mm, Complete/ndx=8mm dy=8mm, h=</u> <u>5.00 mm</u>
Phantom	<u>Validation plane</u>
Device Position	<u>Body back(10mm)</u>
Band	<u>LTE band 71(1 RB#0)</u>

SURFACE SAR

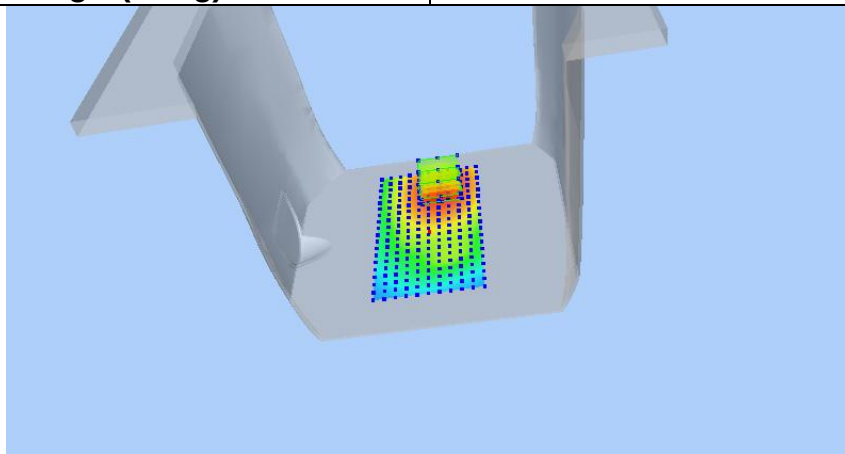


VOLUME SAR

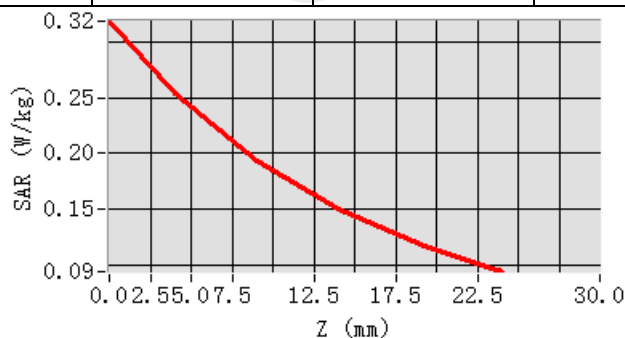


Maximum location: X=11.00, Y=47.00 SAR Peak: 0.32 W/kg

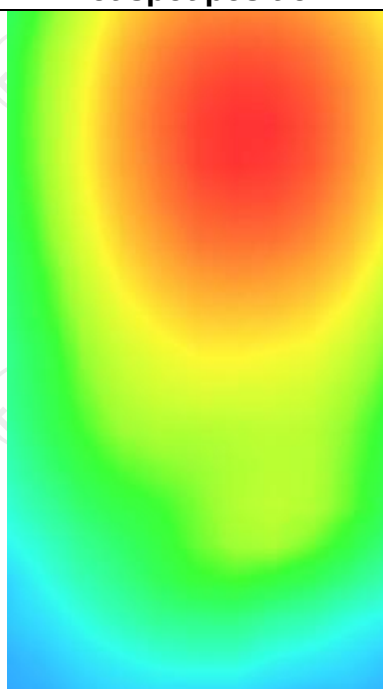
SAR 10g (W/Kg)	0.116201
SAR 1g (W/Kg)	0.179513



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.3181	0.2541	0.1933	0.1498	0.1189



Hot spot position



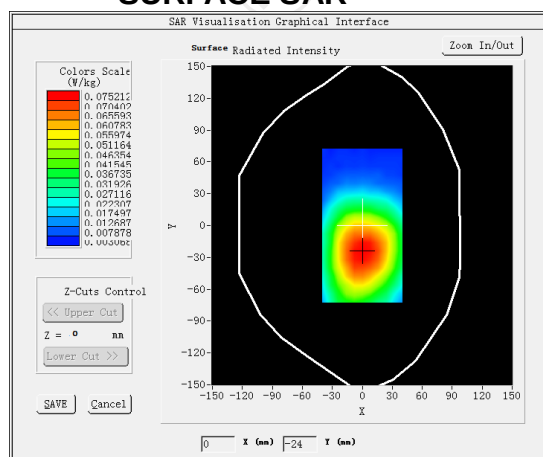
MEASUREMENT 3

High Band SAR (Channel 133372):

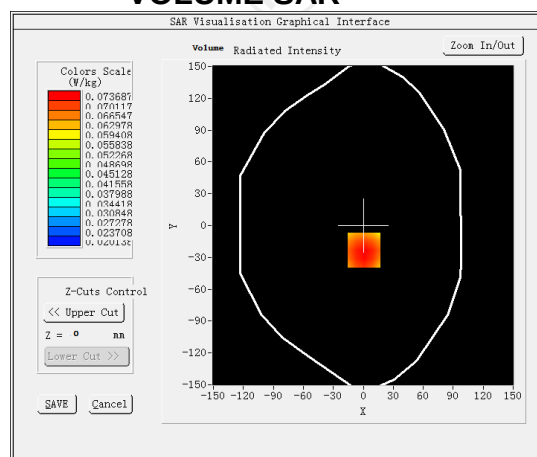
Date: 05/08/2024

Frequency (MHz)	688.000000
Relative permittivity (real part)	41.432976
Relative permittivity (imaginary part)	12.468860
Conductivity (S/m)	0.862835
Variation (%)	-1.080000
Crest Factor	1.0
Probe Conversion factor	1.71
E-Field Probe:	SSE2 (SN 25/22 EPG0375)
Area Scan	<u>dx=8mm dy=8mm, h= 5.00 mm</u>
ZoomScan	<u>5x5x7, dx=8mm dy=8mm</u> <u>dz=5mm, Complete/ndx=8mm dy=8mm, h=</u> <u>5.00 mm</u>
Phantom	Validation plane
Device Position	Body back(hotspot 10mm)
Band	LTE band 71(1 RB#0)

SURFACE SAR



VOLUME SAR



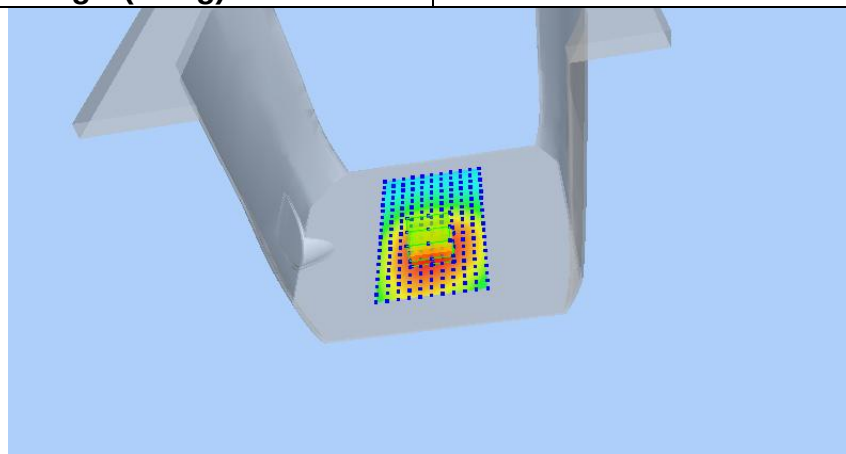
Maximum location: X=7.00, Y=15.00 SAR Peak: 0.41 W/kg

SAR 10g (W/Kg)

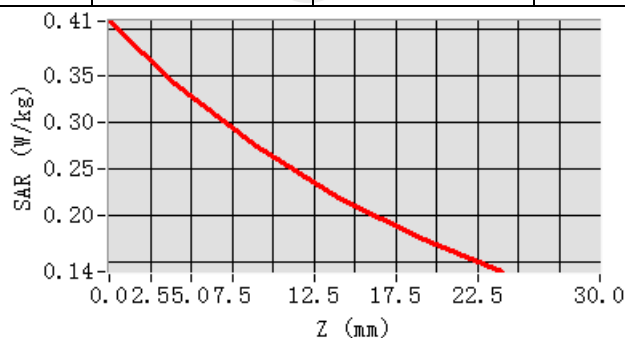
0.142587

SAR 1g (W/Kg)

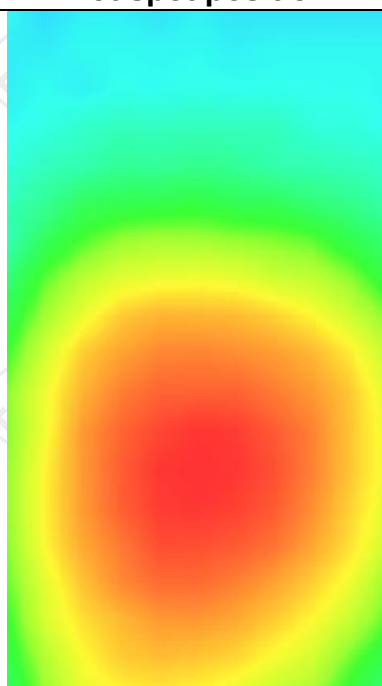
0.264732



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.4080	0.3414	0.2729	0.2187	0.1755



Hot spot position



WLAN 2.4G

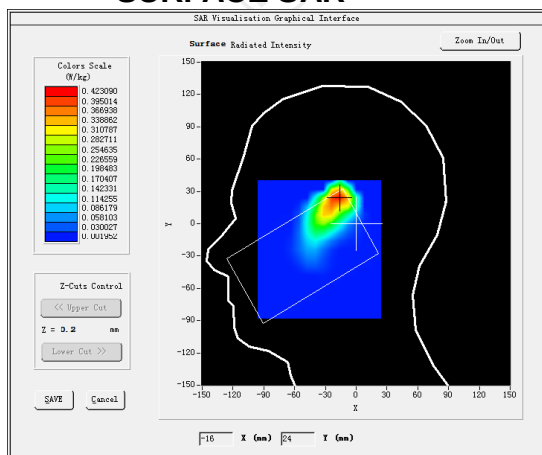
MEASUREMENT 1

High Band SAR (Channel 11):

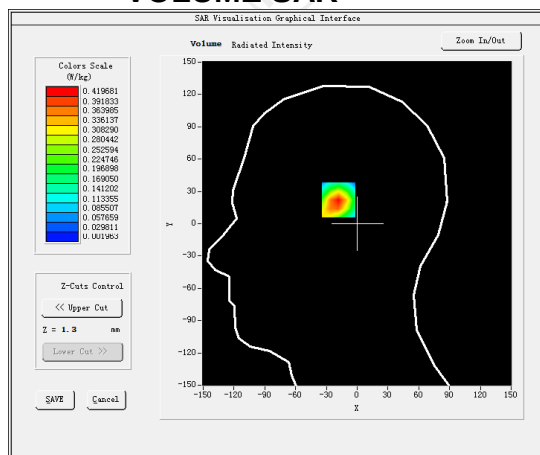
Date: 05/29/2024

Frequency (MHz)	2462.000000
Relative permittivity (real part)	37.821613
Relative permittivity (imaginary part)	13.546980
Conductivity (S/m)	1.834111
Variation (%)	0.340000
Crest Factor	1.0
Probe Conversion factor	2.31
E-Field Probe:	SSE2 (SN 25/22 EPG0375)
Area Scan	<u>dx=12mm dy=12mm, h= 5.00 mm</u>
ZoomScan	<u>5x5x7,dx=5mm dy=5mm</u> <u>dz=5mm,Complete/ndx=8mm dy=8mm, h=</u> <u>5.00 mm</u>
Phantom	<u>Right head</u>
Device Position	<u>Cheek</u>
Band	<u>IEEE 802.11b ISM</u>

SURFACE SAR

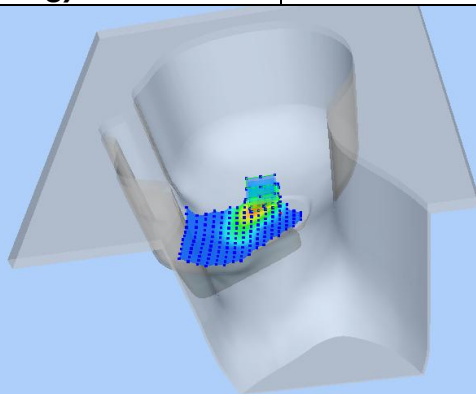


VOLUME SAR

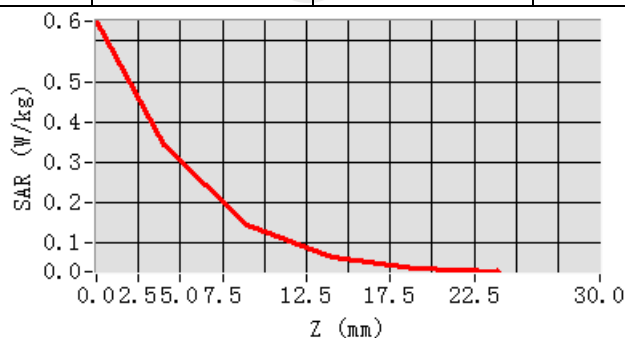


Maximum location: X=-17.00, Y=24.00 SAR Peak: 65 W/kg

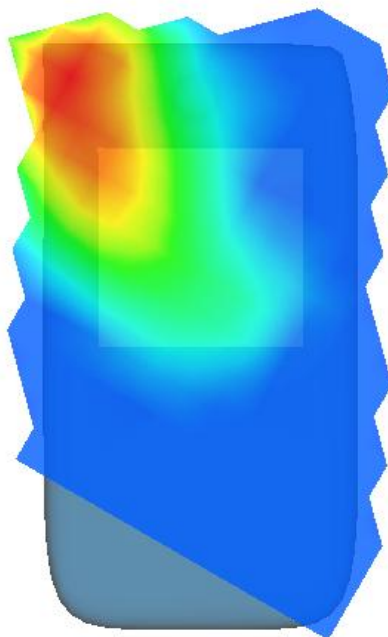
SAR 10g (W/Kg)	0.242620
SAR 1g (W/Kg)	0.301018



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.6498	0.3441	0.1450	0.0643	0.0375



Hot spot position



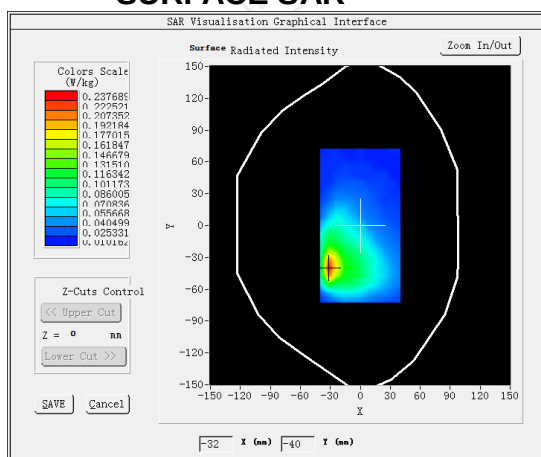
MEASUREMENT 2

High Band SAR (Channel 11):

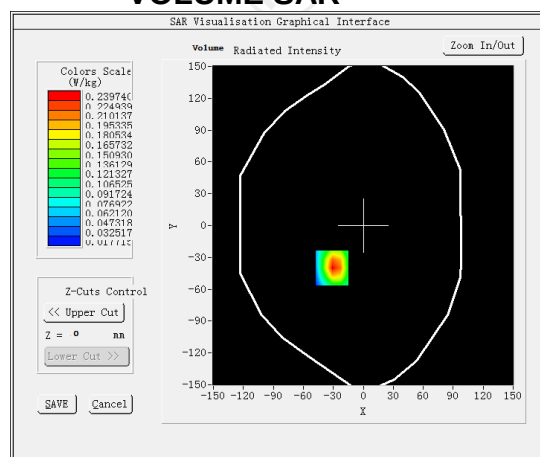
Date: 05/29/2024

Frequency (MHz)	2462.000000
Relative permittivity (real part)	37.821613
Relative permittivity (imaginary part)	13.546980
Conductivity (S/m)	1.834111
Variation (%)	-3.420000
Crest Factor	1.0
Probe Conversion factor	2.31
E-Field Probe:	SSE2 (SN 25/22 EPG0375)
Area Scan	<u>dx=12mm dy=12mm, h= 5.00 mm</u>
ZoomScan	<u>5x5x7, dx=5mm dy=5mm</u> <u>dz=5mm, Complete/ndx=8mm dy=8mm, h=</u> <u>5.00 mm</u>
Phantom	Validation plane
Device Position	Body back(10mm)
Band	<u>IEEE 802.11b ISM</u>

SURFACE SAR

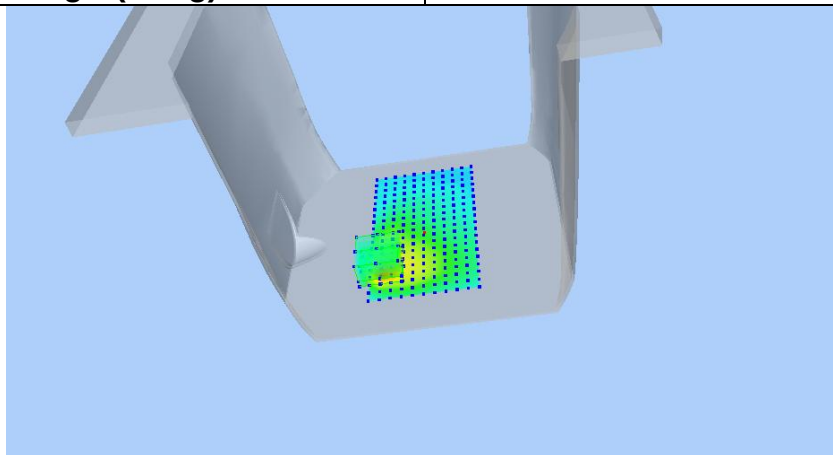


VOLUME SAR

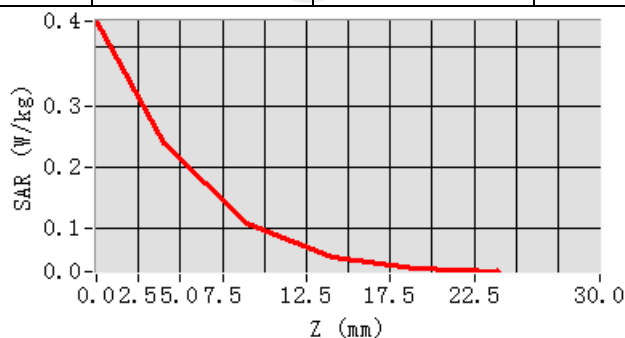


Maximum location: X=-15.00, Y=58.00 SAR Peak: 0.45 W/kg

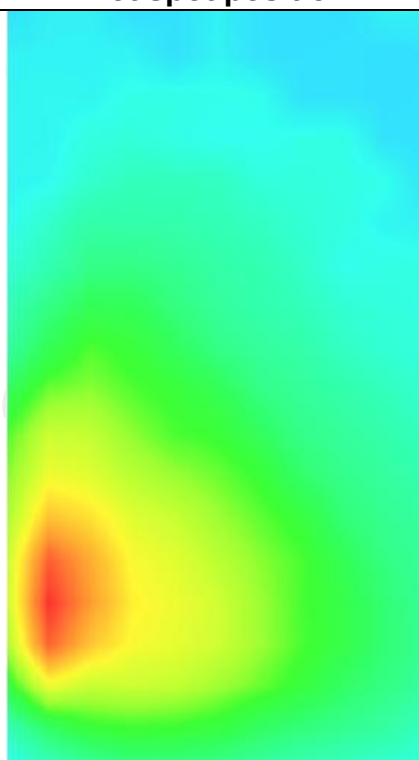
SAR 10g (W/Kg)	0.139510
SAR 1g (W/Kg)	0.243571



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.4417	0.2397	0.1065	0.0517	0.0337



Hot spot position



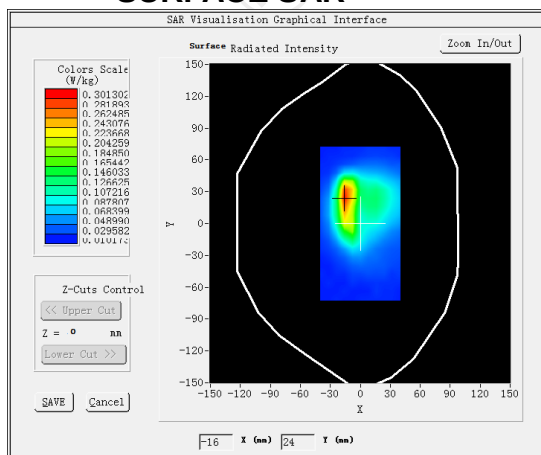
MEASUREMENT 3

High Band SAR (Channel 11):

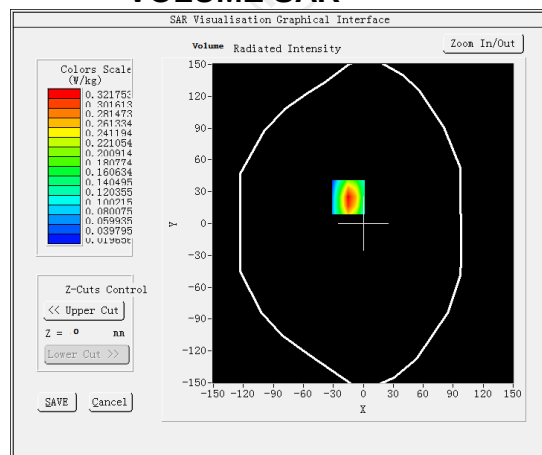
Date: 05/29/2024

Frequency (MHz)	2462.000000
Relative permittivity (real part)	37.821613
Relative permittivity (imaginary part)	13.546980
Conductivity (S/m)	1.834111
Variation (%)	-0.670000
Crest Factor	1.0
Probe Conversion factor	2.31
E-Field Probe:	SSE2 (SN 25/22 EPG0375)
Area Scan	<u>dx=12mm dy=12mm, h= 5.00 mm</u>
ZoomScan	<u>5x5x7, dx=5mm dy=5mm</u> <u>dz=5mm, Complete/ndx=8mm dy=8mm, h=</u> <u>5.00 mm</u>
Phantom	Validation plane
Device Position	Body back(10mm)
Band	<u>IEEE 802.11b ISM(hotspot)</u>

SURFACE SAR

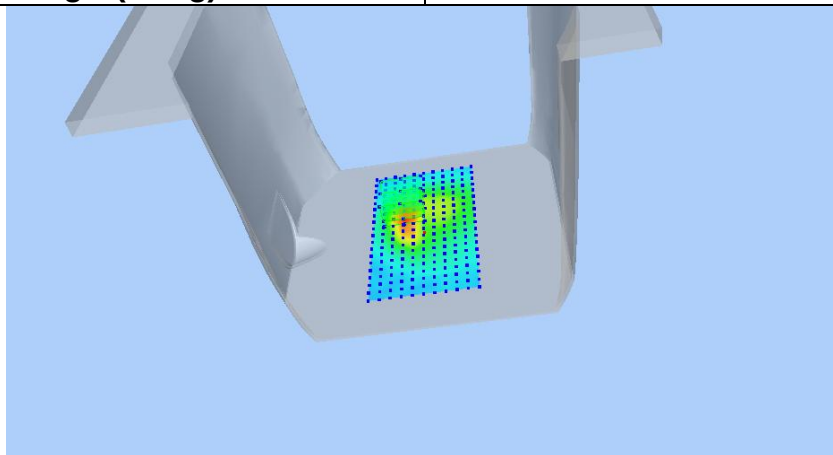


VOLUME SAR

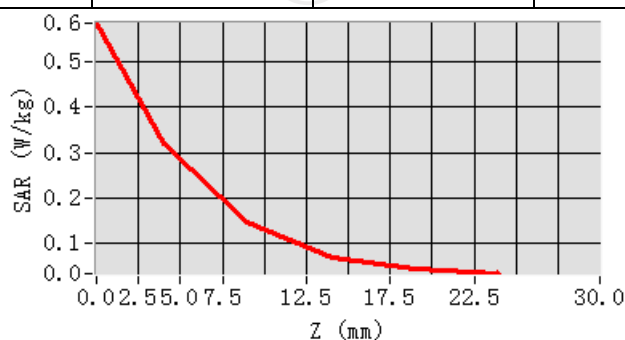


Maximum location: X=-15.00, Y=25.00 SAR Peak: 0.59 W/kg

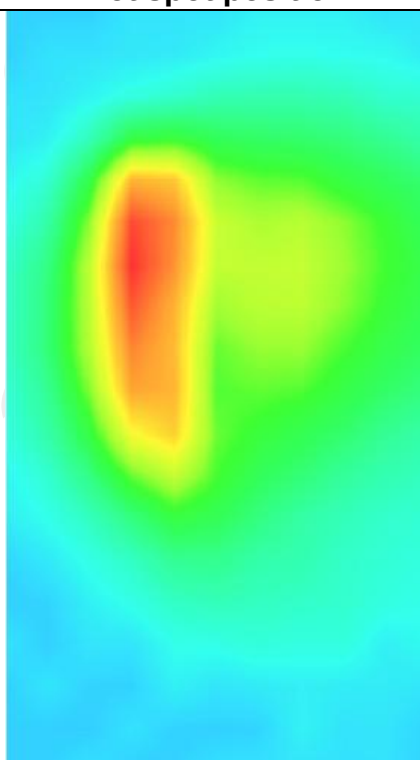
SAR 10g (W/Kg)	0.176371
SAR 1g (W/Kg)	0.286307



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.5845	0.3218	0.1457	0.0709	0.0446



Hot spot position



WLAN 5.2G

MEASUREMENT 1

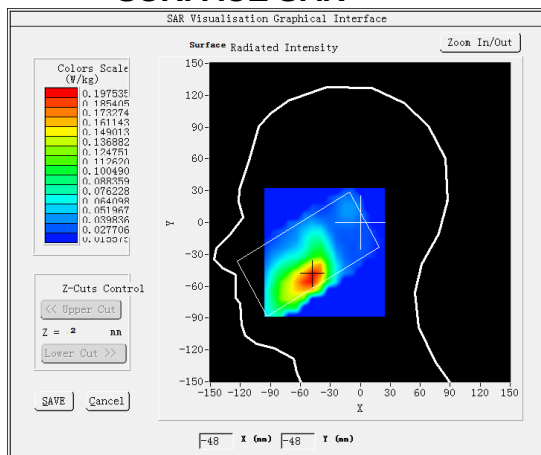
SAR (Channel 36):

Date:

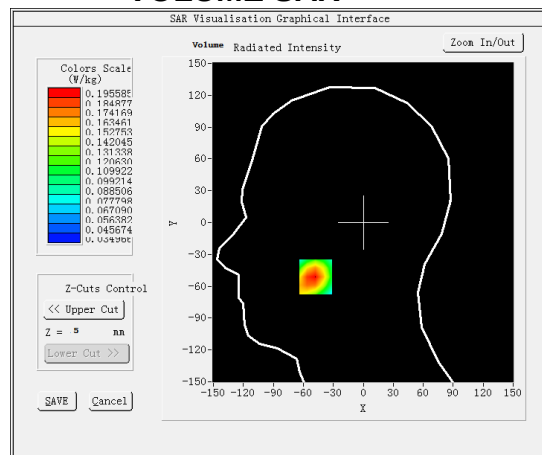
06/06/2024

Frequency (MHz)	5180.000000
Relative permittivity (real part)	36.068832
Relative permittivity (imaginary part)	13.679428
Conductivity (S/m)	4.420788
Variation (%)	2.320000
Crest Factor	1.0
Probe Conversion factor	2.01
E-Field Probe:	SSE2 (SN 25/22 EPG0375)
Area Scan	<u>dx=10mm dy=10mm, h= 5.00 mm</u>
ZoomScan	<u>5x5x7,dx=4mm dy=4mm</u> <u>dz=2mm,Complete/ndx=8mm dy=8mm, h=</u> <u>5.00 mm</u>
Phantom	<u>Left head</u>
Device Position	<u>Cheek</u>
Band	<u>IEEE 802.11ac ISM</u>

SURFACE SAR



VOLUME SAR



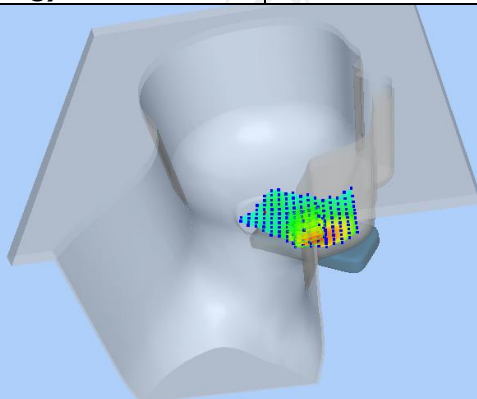
Maximum location: X=-48.00, Y=-51.00 SAR Peak: 0.26 W/kg

SAR 10g (W/Kg)

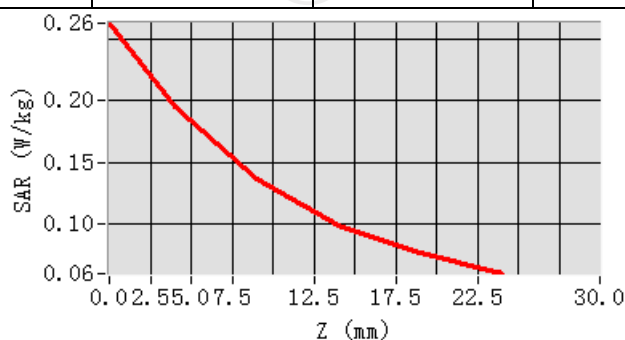
0.103112

SAR 1g (W/Kg)

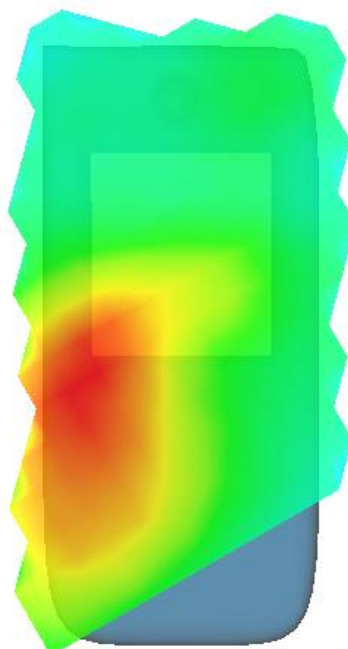
0.131751



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.2631	0.1956	0.1367	0.0994	0.0763



Hot spot position



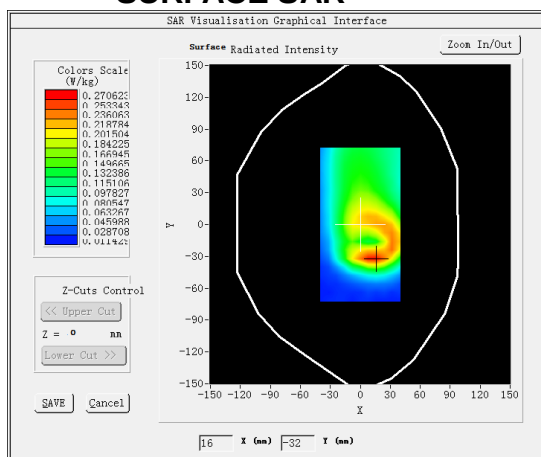
MEASUREMENT 2

SAR (Channel 36):
06/06/2024

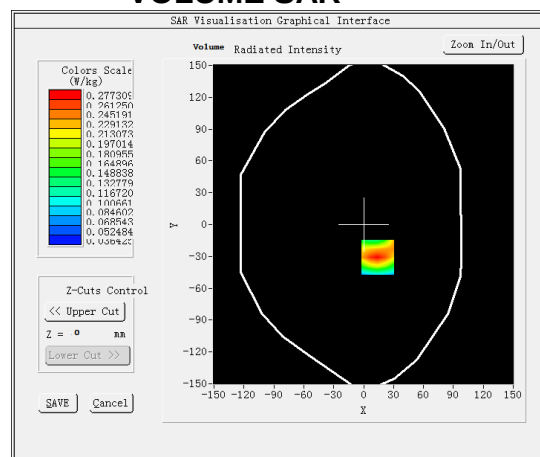
Date:

Frequency (MHz)	5180.000000
Relative permittivity (real part)	36.068832
Relative permittivity (imaginary part)	13.679428
Conductivity (S/m)	4.420788
Variation (%)	2.660000
Crest Factor	1.0
Probe Conversion factor	2.01
E-Field Probe:	SSE2 (SN 25/22 EPG0375)
Area Scan	<u>dx=10mm dy=10mm, h= 5.00 mm</u>
ZoomScan	<u>5x5x7, dx=4mm dy=4mm</u> <u>dz=2mm, Complete/ndx=8mm dy=8mm, h=</u> <u>5.00 mm</u>
Phantom	Validation plane
Device Position	Body back(10mm)
Band	<u>IEEE 802.11ac ISM</u>

SURFACE SAR



VOLUME SAR



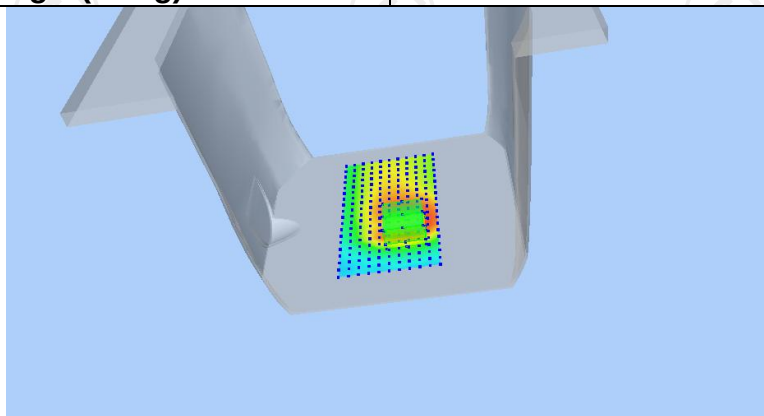
Maximum location: X=14.00, Y=-31.00 SAR Peak: 0.43 W/kg

SAR 10g (W/Kg)

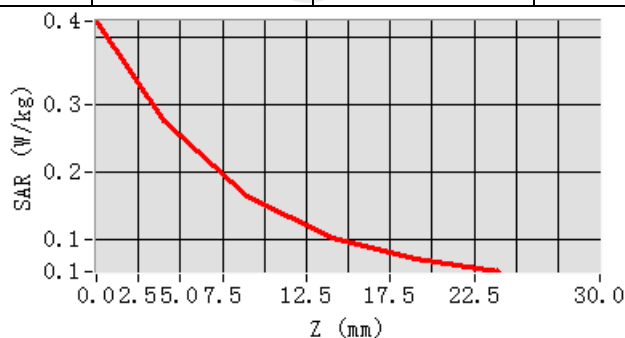
0.176244

SAR 1g (W/Kg)

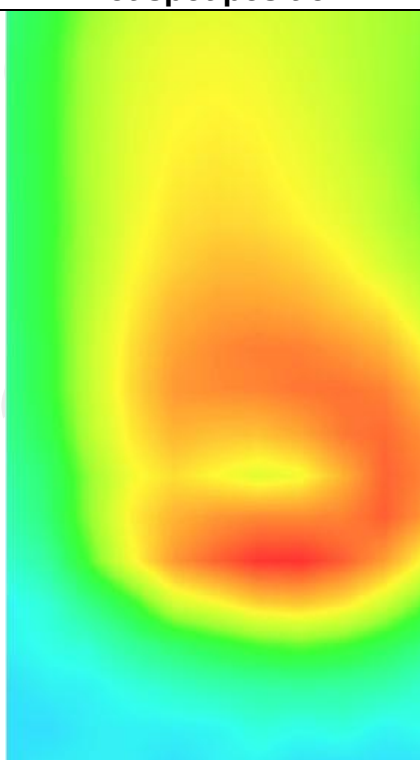
0.210571



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.4238	0.2773	0.1633	0.1018	0.0709



Hot spot position



WLAN 5.8G

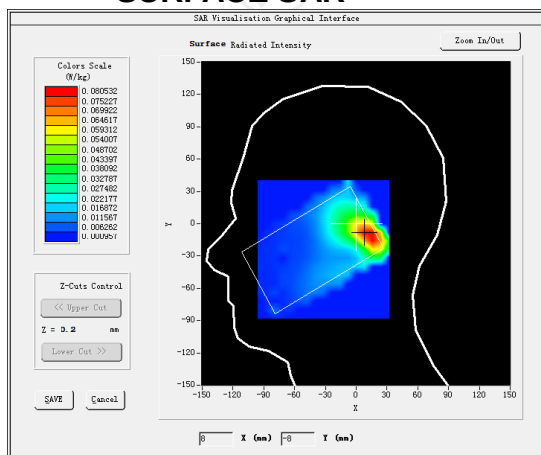
MEASUREMENT 1

SAR (Channel 151):

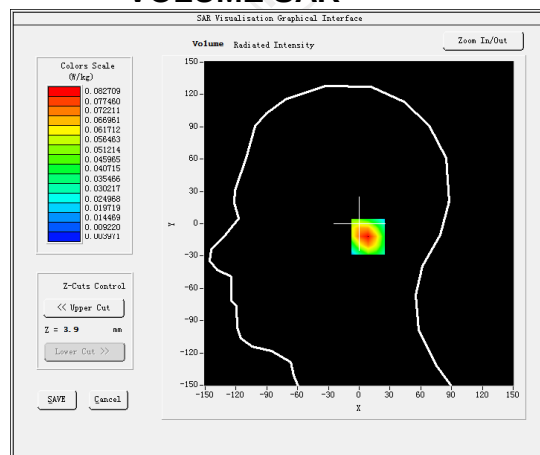
Date: 06/11/2024

Frequency (MHz)	5755.000000
Relative permittivity (real part)	34.352823
Relative permittivity (imaginary part)	13.671675
Conductivity (S/m)	5.030828
Variation (%)	0.820000
Crest Factor	1.0
Probe Conversion factor	2.06
E-Field Probe:	SSE2 (SN 25/22 EPG0375)
Area Scan	<u>dx=10mm dy=10mm, h= 5.00 mm</u>
ZoomScan	<u>5x5x7,dx=4mm dy=4mm</u> <u>dz=2mm,Complete/ndx=8mm dy=8mm, h=</u> <u>5.00 mm</u>
Phantom	<u>Left head</u>
Device Position	<u>Cheek</u>
Band	<u>IEEE 802.11n ISM</u>

SURFACE SAR

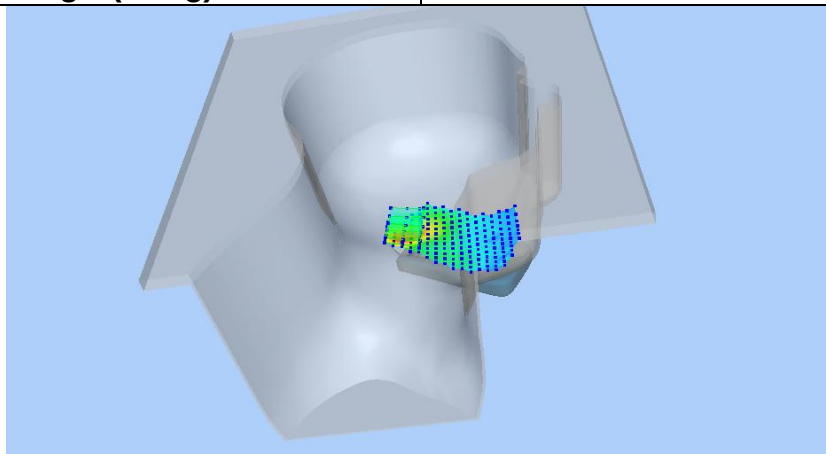


VOLUME SAR

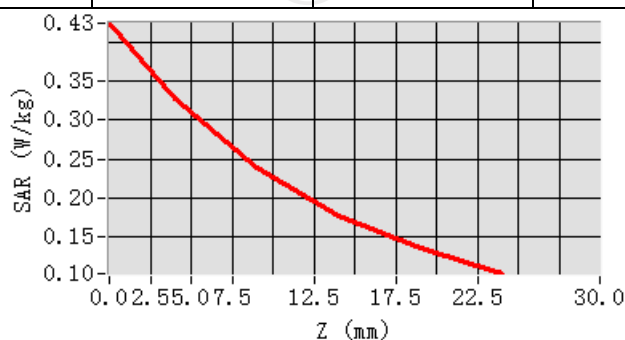


Maximum location: X=18.00, Y=-10.00 SAR Peak: 0.43 W/kg

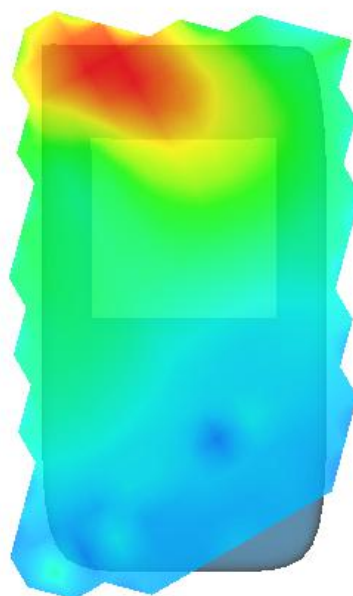
SAR 10g (W/Kg)	0.102374
SAR 1g (W/Kg)	0.210640



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.4252	0.3286	0.2391	0.1773	0.1347



Hot spot position



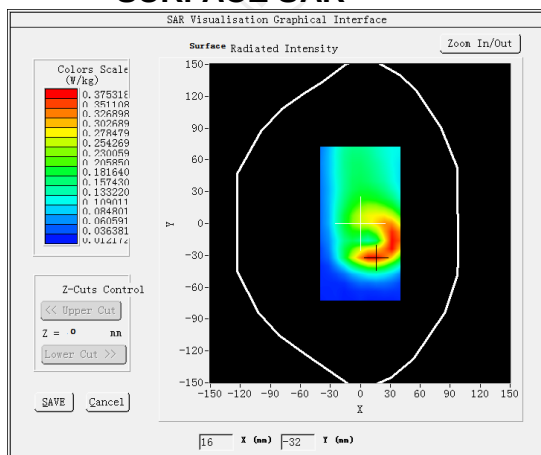
MEASUREMENT 2

SAR (Channel 151):

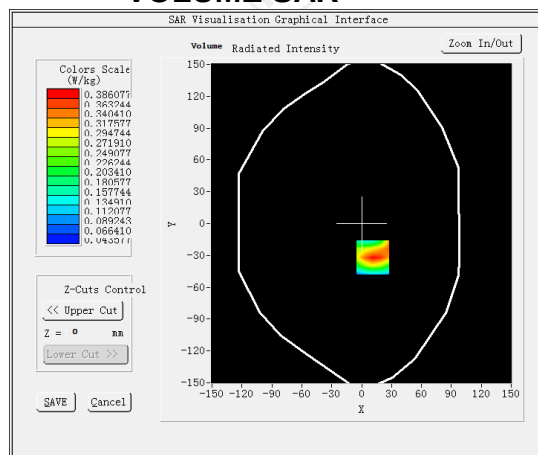
Date: 06/11/2024

Frequency (MHz)	5755.000000
Relative permittivity (real part)	34.352823
Relative permittivity (imaginary part)	13.671675
Conductivity (S/m)	5.030828
Variation (%)	0.060000
Crest Factor	1.0
Probe Conversion factor	2.06
E-Field Probe:	SSE2 (SN 25/22 EPG0375)
Area Scan	<u>dx=10mm dy=10mm, h= 5.00 mm</u>
ZoomScan	<u>5x5x7,dx=4mm dy=4mm</u> <u>dz=2mm,Complete/ndx=8mm dy=8mm, h=</u> <u>5.00 mm</u>
Phantom	Validation plane
Device Position	Body back(10mm)
Band	<u>IEEE 802.11n ISM</u>

SURFACE SAR

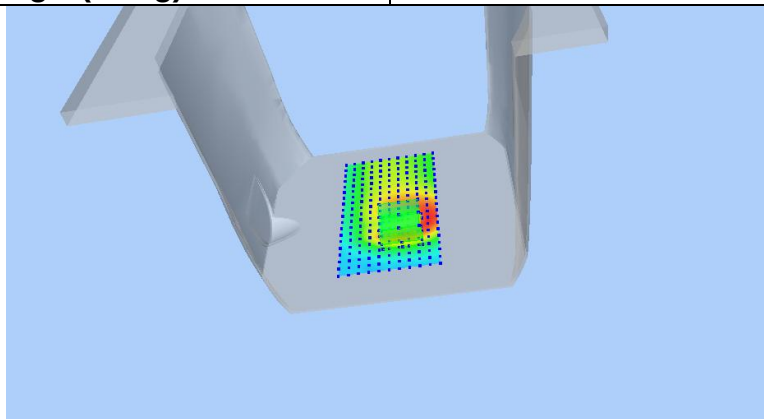


VOLUME SAR

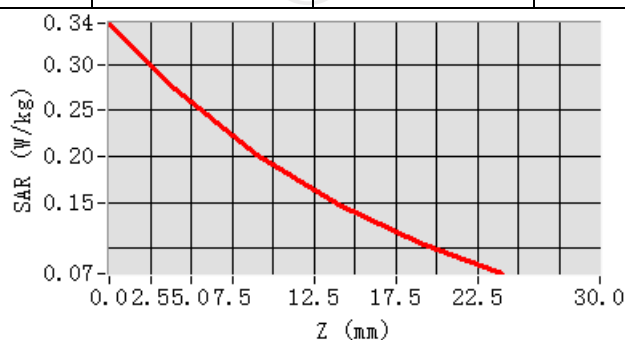


Maximum location: X=-11.00, Y=-18.00 SAR Peak: 0.35 W/kg

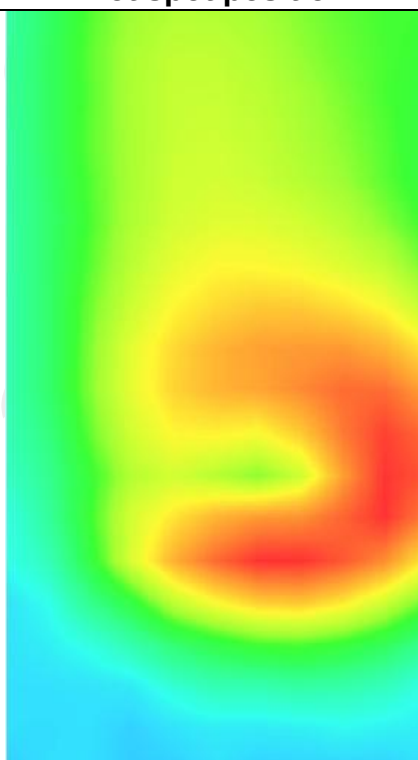
SAR 10g (W/Kg)	0.133057
SAR 1g (W/Kg)	0.167114



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.3444	0.2727	0.2013	0.1469	0.1055



Hot spot position



BT

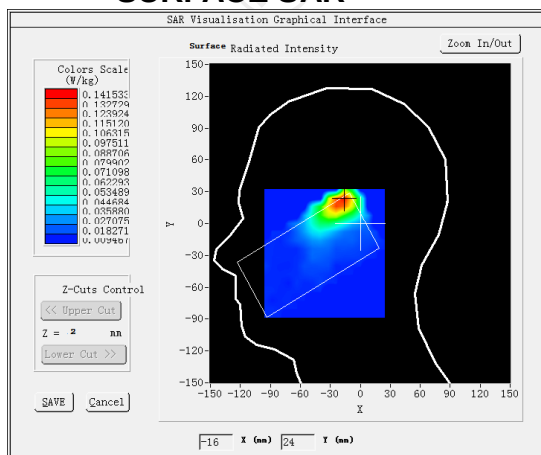
MEASUREMENT 1

Middle Band SAR (Channel 39):

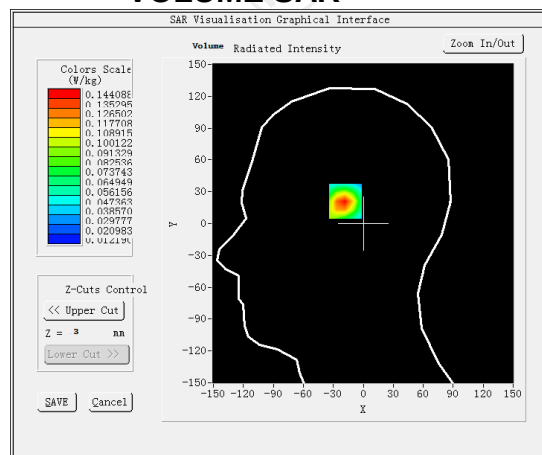
Date: 05/15/2024

Frequency (MHz)	2441.000000
Relative permittivity (real part)	37.821613
Relative permittivity (imaginary part)	13.546980
Conductivity (S/m)	1.834111
Variation (%)	0.200000
Crest Factor	1.0
Probe Conversion factor	2.31
E-Field Probe:	SSE2 (SN 25/22 EPG0375)
Area Scan	<u>dx=12mm dy=12mm, h= 5.00 mm</u>
ZoomScan	<u>5x5x7,dx=5mm dy=5mm</u> <u>dz=5mm,Complete/ndx=8mm dy=8mm, h=</u> <u>5.00 mm</u>
Phantom	<u>Left head</u>
Device Position	<u>Cheek</u>
Band	<u>GFSK</u>

SURFACE SAR



VOLUME SAR



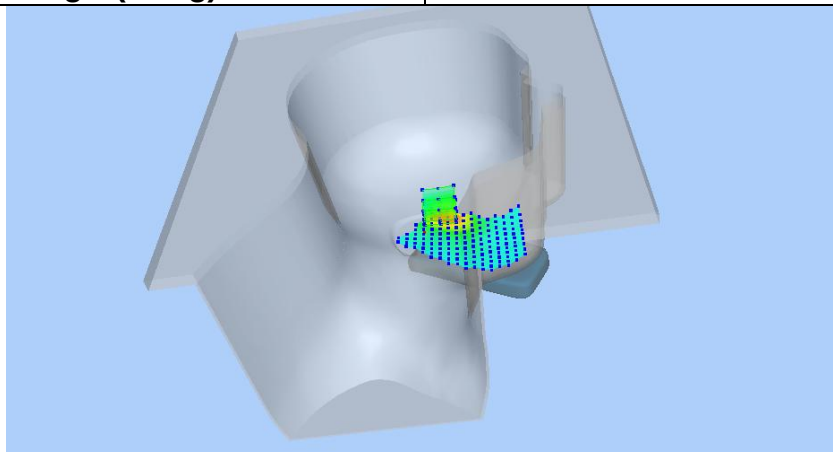
Maximum location: X=-17.00, Y=23.00 SAR Peak: 0.22 W/kg

SAR 10g (W/Kg)

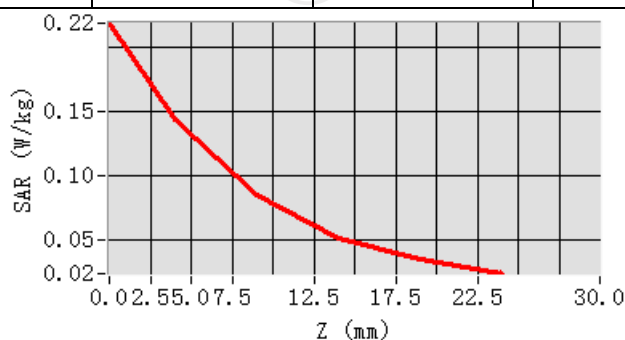
0.075130

SAR 1g (W/Kg)

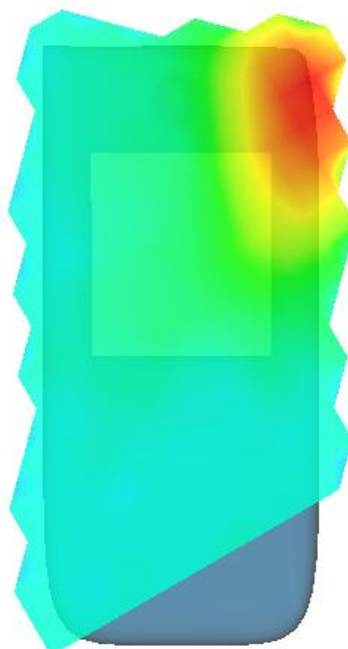
0.120245



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.2186	0.1441	0.0851	0.0523	0.0350



Hot spot position



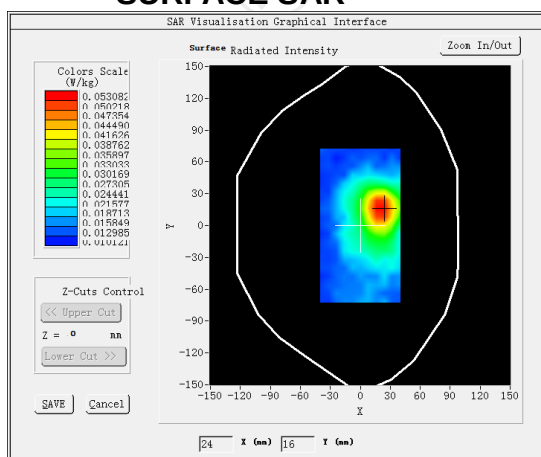
MEASUREMENT 2

Middle Band SAR (Channel 39):

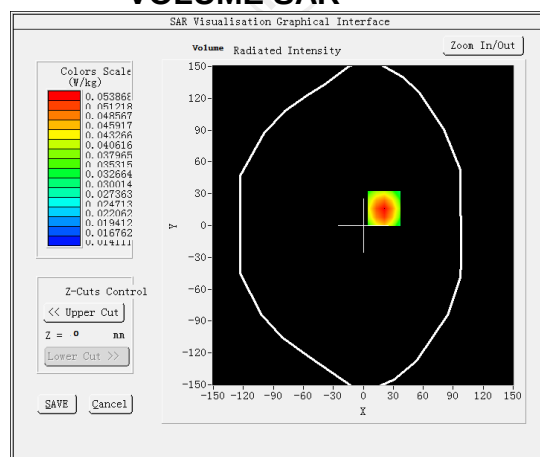
Date: 05/15/2024

Frequency (MHz)	2441.000000
Relative permittivity (real part)	37.821613
Relative permittivity (imaginary part)	13.546980
Conductivity (S/m)	1.834111
Variation (%)	-1.820000
Crest Factor	1.0
Probe Conversion factor	2.31
E-Field Probe:	SSE2 (SN 25/22 EPG0375)
Area Scan	<u>dx=12mm dy=12mm, h= 5.00 mm</u>
ZoomScan	<u>5x5x7,dx=5mm dy=5mm</u> <u>dz=5mm,Complete/ndx=8mm dy=8mm, h=</u> <u>5.00 mm</u>
Phantom	Validation plane
Device Position	Body back(10mm)
Band	<u>GFSK</u>

SURFACE SAR

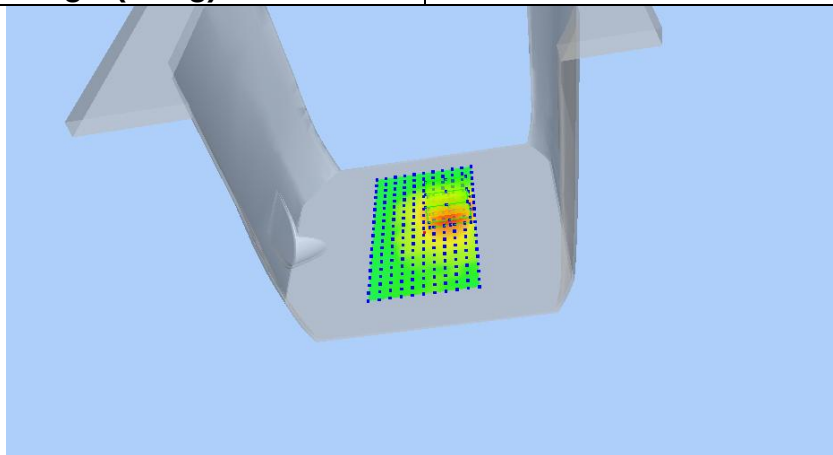


VOLUME SAR

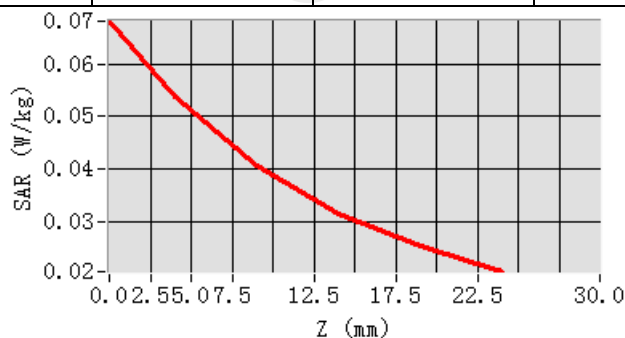


Maximum location: X=21.00, Y=16.00 SAR Peak: 0.07 W/kg

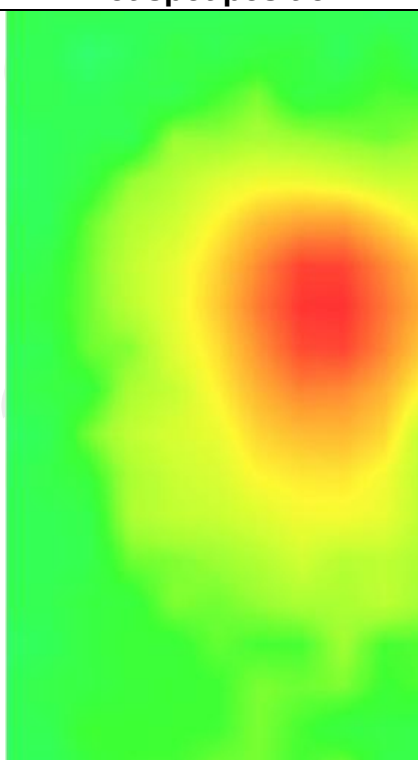
SAR 10g (W/Kg)	0.033175
SAR 1g (W/Kg)	0.041258



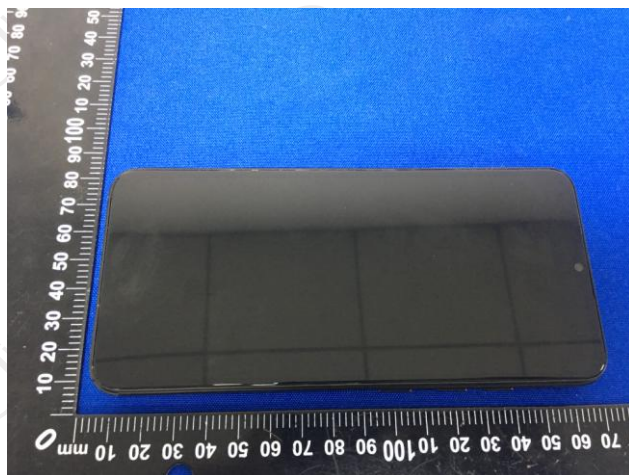
Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.0681	0.0539	0.0406	0.0315	0.0252



Hot spot position



Appendix A: EUT Photos



Liquid depth



The Body Liquid of 835MHz (15.4cm)



The Body Liquid of 1800MHz (15.2 cm)



The Body Liquid of 1900MHz (16.4 cm)



The Body Liquid of 2450MHz (15.3cm)



The Body Liquid of 2600MHz (16.5cm)



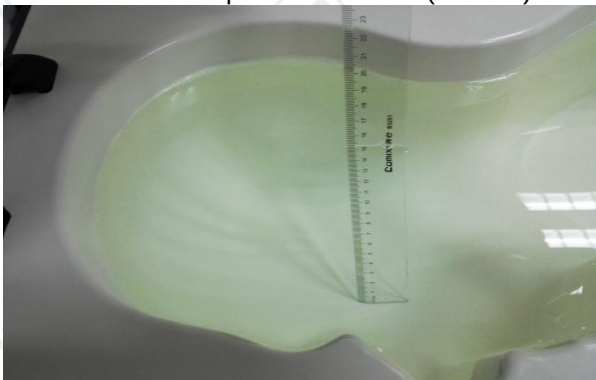
The Body Liquid of 5000-6000MHz (16.5cm)



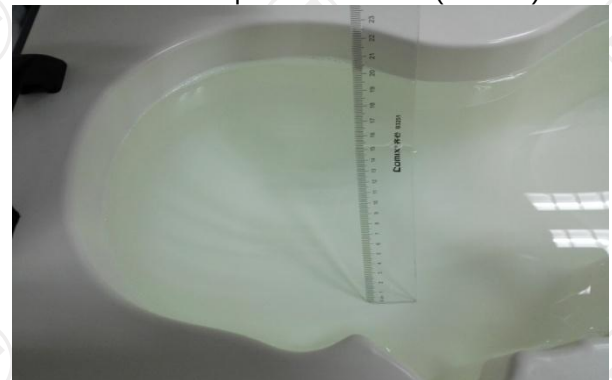
The Head Liquid of 1900MHz (15.5cm)



The Head Liquid of 2450MHz (15.6cm)



The Head Liquid of 835MHz (15.3cm)



The Head Liquid of 1800MHz (15.2cm)

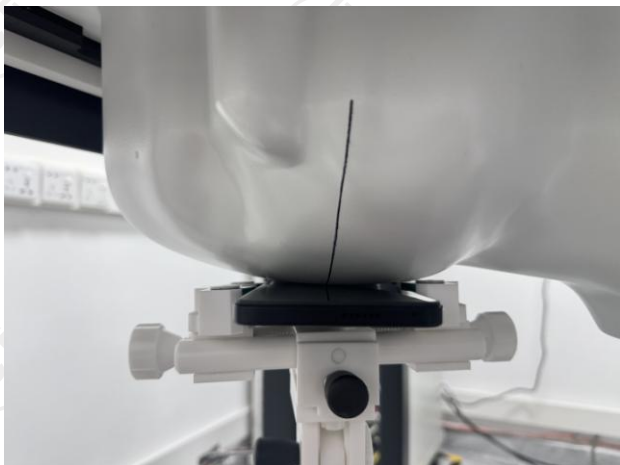


The Head Liquid of 2600MHz (15.1cm)

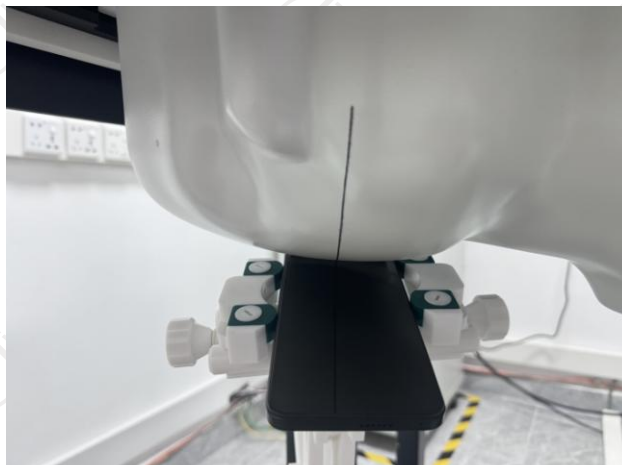


The Body Liquid of 5000-6000MHz MHz (15.8cm)

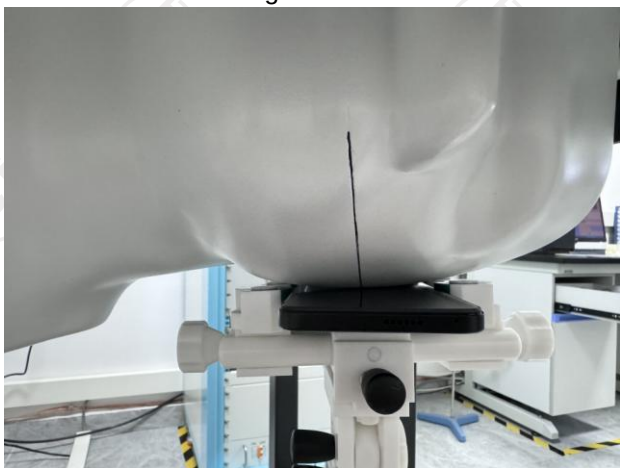
Appendix B: Test Setup Photos



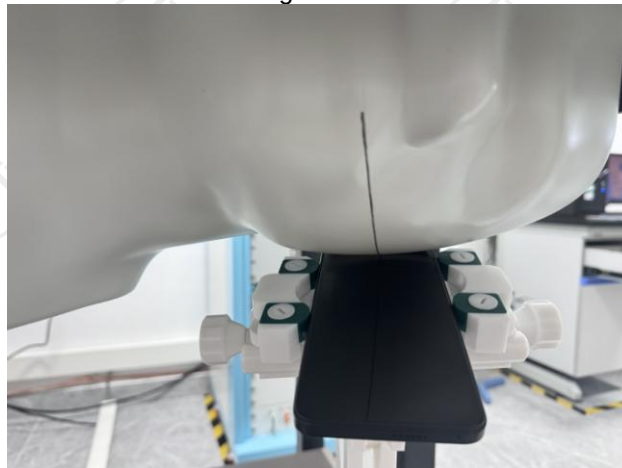
Right Cheek



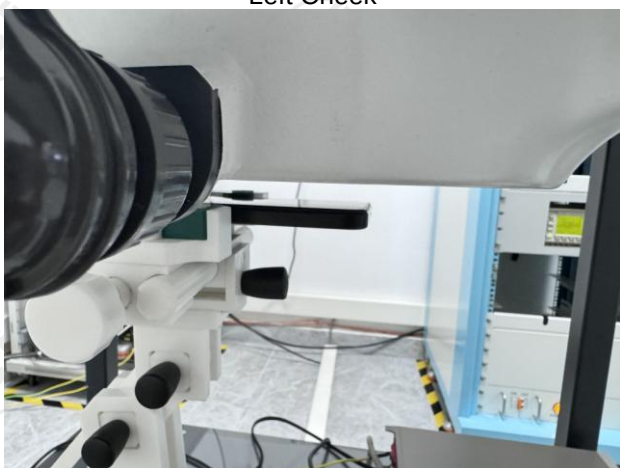
Right Tilted



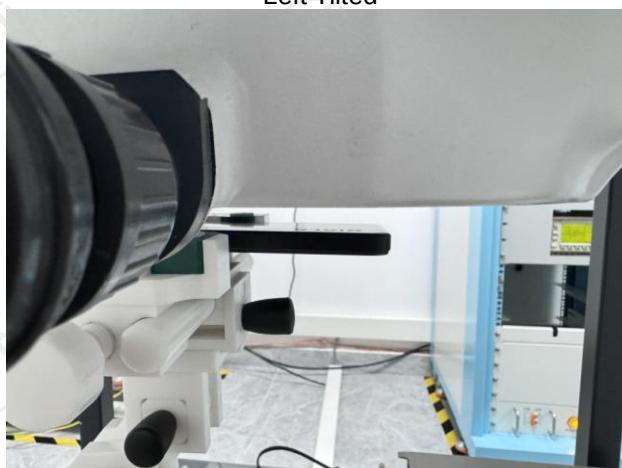
Left Cheek



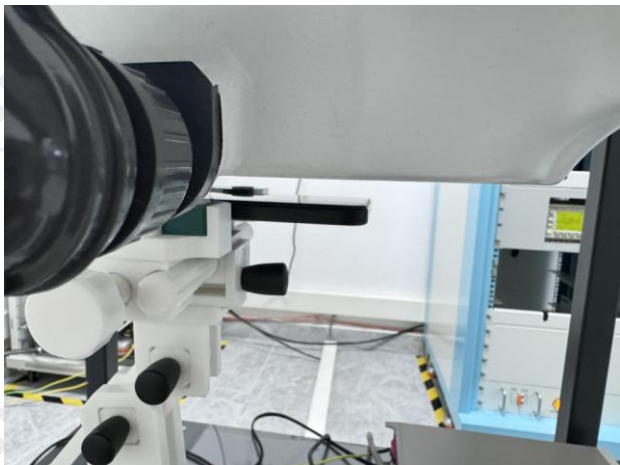
Left Tilted



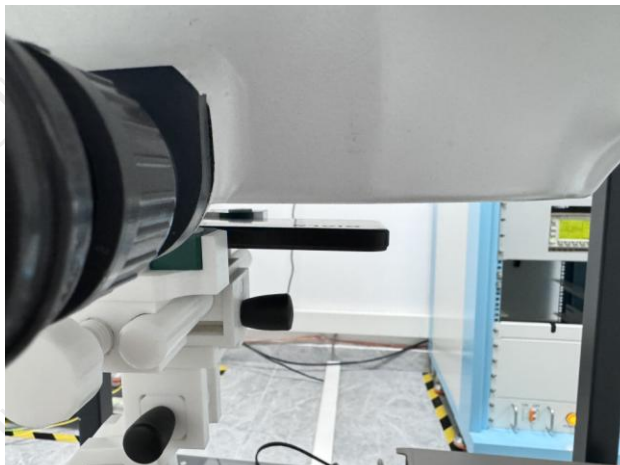
Body worn – Front (10mm)



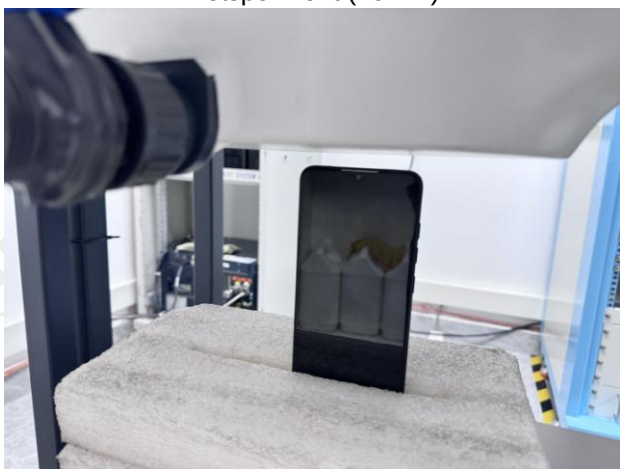
Body worn – Back (10mm)



Hotspo Front (10mm)



Hotspo Back (10mm)



Hotspot Top (10mm)



Hotspot Right (10mm)



Hotspot Left (10mm)



Hotspot Bottom (10mm)

Appendix C: Probe Calibration Certificate

COMOSAR E-FIELD Probe



COMOSAR E-Field Probe Calibration Report

Ref : ACR.180.7.22.BES.B

SHENZHEN TONGCE TESTING LAB

2101 & 2201, ZHENCHANG FACTORY RENSHAN INDUSTRIAL
ZONE, FUHAI SUBDISTRICT, BAO'AN DISTRICT SHENZHEN,
GUANGDONG, 518103, PEOPLE'S REPUBLIC OF CHINA
MVG COMOSAR DOSIMETRIC E-FIELD PROBE

SERIAL NO.: SN 25/22 EPG0375

Calibrated at MVG

Z.I. de la pointe du diable

Technopôle Brest Iroise – 295 avenue Alexis de Rochon

29280 PLOUZANE - FRANCE

Calibration date: 06/29/2023



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.180.7.22.BES.B

	Name	Function	Date	Signature
Prepared by :	Jérôme Le Gall	Measurement Responsible	6/30/2023	
Checked & approved by:	Jérôme Luc	Technical Manager	6/30/2023	
Authorized by:	Yann Toutain	Laboratory Director	7/05/2023	

	Customer Name
Distribution :	Shenzhen Tongce Testing Lab

Issue	Name	Date	Modifications
A	Jérôme Le Gall	6/30/2023	Initial release

Page: 2/11

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COMOSAR E-FIELD PROBE CALIBRATION REPORT

Ref: ACR.180.7.22 BES.B

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1 DEVICE UNDER TEST

Device Under Test	
Device Type	COMOSAR DOSIMETRIC E FIELD PROBE
Manufacturer	MVG
Model	SSE2
Serial Number	SN 25/22 EPGO375
Product Condition (new / used)	New
Frequency Range of Probe	0.15 GHz-6GHz
Resistance of Three Dipoles at Connector	Dipole 1: R1=0.197 MΩ Dipole 2: R2=0.230 MΩ Dipole 3: R3=0.208 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 affect. All calibrations / measurements performed meet the fore mentioned standards.

3.1 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.

3.2 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.

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3.3 LOWER DETECTION LIMIT

The lower detection limit was assessed using the same measurement set up as used for the linearity measurement. The required lower detection limit is 10 mW/kg.

3.4 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°).

3.1 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:

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

where

$SAR_{uncertainty}$	is the uncertainty in percent of the probe boundary effect
d_{be}	is the distance between the surface and the closest <i>zoom-scan</i> 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 SAR uncertainty[%] for scanning distances larger than 4mm is 1.0% Limit ,2%).



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 an E-field probe calibration using the waveguide technique. 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.

Uncertainty analysis of the probe calibration in waveguide					
ERROR SOURCES	Uncertainty value (%)	Probability Distribution	Divisor	ci	Standard Uncertainty (%)
Expanded uncertainty 95 % confidence level k = 2					14 %

5 CALIBRATION MEASUREMENT RESULTS

Calibration Parameters	
Liquid Temperature	20 +/- 1 °C
Lab Temperature	20 +/- 1 °C
Lab Humidity	30-70 %

5.1 SENSITIVITY IN AIR

Normx dipole 1 (μV/(V/m) ²)	Normy dipole 2 (μV/(V/m) ²)	Normz dipole 3 (μV/(V/m) ²)
0.64	0.53	0.44

DCP dipole 1 (mV)	DCP dipole 2 (mV)	DCP dipole 3 (mV)
106	108	109

Calibration curves $e_i=f(V)$ ($i=1,2,3$) allow to obtain E-field value using the formula:

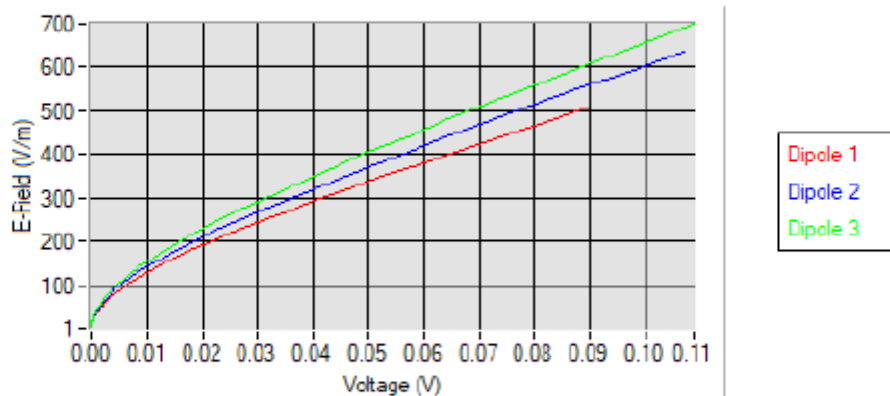
$$E = \sqrt{E_1^2 + E_2^2 + E_3^2}$$



COMOSAR E-FIELD PROBE CALIBRATION REPORT

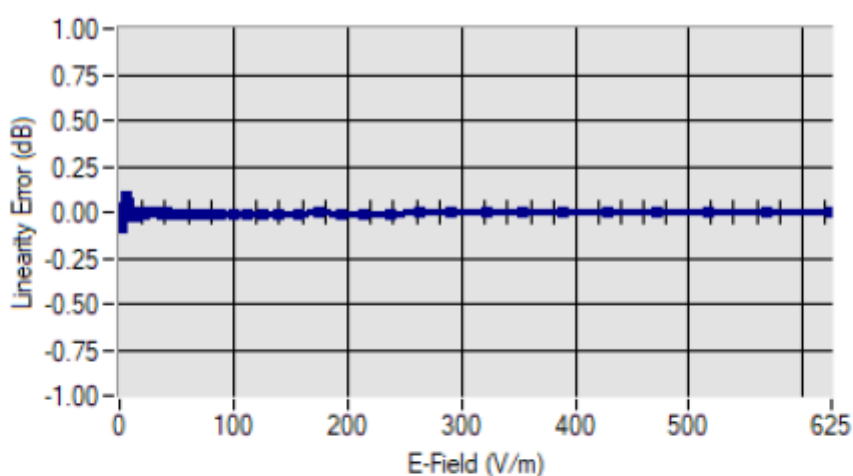
Ref: ACR.180.7.22.BES.B

Calibration curves



5.2 LINEARITY

Linearity



Linearity: $\pm 1.94\%$ ($\pm 0.09\text{dB}$)



COMOSAR E-FIELD PROBE CALIBRATION REPORT

Ref: ACR.180.7.22.BES.B

5.3 SENSITIVITY IN LIQUID

Liquid	Frequency (MHz +/- 100MHz)	ConvF
HL750	750	1.71
BL750	750	1.78
HL900	900	1.91
BL900	900	1.96
HL1800	1800	2.08
BL1800	1800	2.16
HL2000	2000	2.03
BL2000	2000	2.10
HL2450	2450	2.31
BL2450	2450	2.37
HL2600	2600	2.16
BL2600	2600	2.23
HL3500	3500	2.21
BL3500	3500	2.28
HL3700	3700	3.45
BL3700	3700	3.15
HL4600	4600	3.30
BL4600	4600	3.70
HL5200	5200	2.01
BL5200	5200	2.08
HL5600	5600	2.07
BL5600	5600	2.12
HL5800	5800	2.06
BL5800	5800	2.13

LOWER DETECTION LIMIT: 7mW/kg

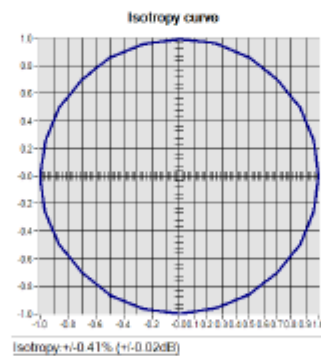


COMOSAR E-FIELD PROBE CALIBRATION REPORT

Ref: ACR.180.7.22.BES.B

5.4 ISOTROPY

HL1800 MHz





COMOSAR E-FIELD PROBE CALIBRATION REPORT

Ref: ACR.180.7.22.BES.B

6 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	10/2023	10/2026
Network Analyzer – Calibration kit	HP 85033D	3423A08186	06/2021	06/2027
Multimeter	Keithley 2000	1160271	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	Rohde & Schwarz NRVD	832839-056	11/2023	11/2026
Directional Coupler	Krytar 158020	131467	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
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.

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COMOSAR E-FIELD PROBE CALIBRATION REPORT

Ref: ACR.180.7.22.BES.B

Liquid transition	MVG	SN 32/16 WGLIQ_5G000_1	Validated. No cal required.	Validated. No cal required.
Temperature / Humidity Sensor	Testo 184 H1	44225320	06/2021	06/2024

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Dielectric Probe Calibration Report

Ref : ACR.138.4.33.SATU.A

SHENZHEN TONGCE TESTING LAB
2101&2201, ZHENCHANG FACTORY, RENSHAN
INDUSTRIAL ZONE, FUHAI SUBDISTRICT, BAOAN
DISTRICT, SHENZHEN, GUANGDONG, 518103,
PEOPLES REPUBLIC OF CHINA
MVG COMOSAR DOSIMETRIC E-FIELD PROBE

FREQUENCY: 0.3-6 GHZ
SERIAL NO.: SN 19/15 OCPG 71

Calibrated at MVG US
2105 Barrett Park Dr. - Kennesaw, GA 30144



Calibration Date: 06/05/2024

Summary:

This document presents the method and results from an accredited Dielectric Probe calibration performed in MVG USA using the LIMESAR test bench. All calibration results are traceable to national metrology institutions.



SAR DIELECTRIC PROBE CALIBRATION REPORT

Ref: ACR.138.4.33..SATU.A

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A	06/05/2024	Initial release

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1 INTRODUCTION

This document contains a summary of the suggested methods and requirements set forth by the IEEE 1528 and CEI/IEC 62209 standards for liquid permittivity measurements 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	LIMESAR DIELECTRIC PROBE
Manufacturer	MVG
Model	SCLMP
Serial Number	SN 19/15 OCPG 71
Product Condition (new / used)	Used

A yearly calibration interval is recommended.

3 PRODUCT DESCRIPTION

3.1 GENERAL INFORMATION

MVG's Dielectric Probes are built in accordance to the IEEE 1528 and CEI/IEC 62209 standards. The product is designed for use with the LIMESAR test bench only.



Figure 1 – MVG LIMESAR Dielectric Probe

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4 MEASUREMENT METHOD

The IEEE 1528, OET 65 Bulletin C and CEI/IEC 62209-1 & 2 standards outline techniques for dielectric property measurements. The LIMESAR test bench employs one of the methods outlined in the standards, using a contact probe or open-ended coaxial transmission-line probe and vector network analyzer. The standards recommend the measurement of two reference materials that have well established and stable dielectric properties to validate the system, one for the calibration and one for checking the calibration. The LIMESAR test bench uses De-ionized water as the reference for the calibration and either DMS or Methanol as the reference for checking the calibration. The following measurements were performed to verify that the product complies with the fore mentioned standards.

4.1 LIQUID PERMITTIVITY MEASUREMENTS

The permittivity of a liquid with well established dielectric properties was measured and the measurement results compared to the values provided in the fore mentioned standards.

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 DIELECTRIC PERMITTIVITY MEASUREMENT

The following uncertainties apply to the Dielectric Permittivity measurement:

Uncertainty analysis of Permittivity Measurement					
ERROR SOURCES	Uncertainty value (+/-%)	Probability Distribution	Divisor	ci	Standard Uncertainty (+/-%)
Repeatability (n repeats, mid-band)	4.00%	N	1	1	4.000%
Deviation from reference liquid	5.00%	R	$\sqrt{3}$	1	2.887%
Network analyser-drift, linearity	2.00%	R	$\sqrt{3}$	1	1.155%
Test-port cable variations	0.00%	U	$\sqrt{2}$	1	0.000%
Combined standard uncertainty					5.066%
Expanded uncertainty (confidence level of 95%, $k=2$)					10.0%

Uncertainty analysis of Conductivity Measurement					
ERROR SOURCES	Uncertainty value (+/-%)	Probability Distribution	Divisor	ci	Standard Uncertainty (+/-%)
Repeatability (n repeats, mid-band)	3.50%	N	1	1	3.500%
Deviation from reference liquid	3.00%	R	$\sqrt{3}$	1	1.732%
Network analyser-drift, linearity	2.00%	R	$\sqrt{3}$	1	1.155%
Test-port cable variations	0.00%	U	$\sqrt{2}$	1	0.000%
Combined standard uncertainty					4.072%
Expanded uncertainty (confidence level of 95%, $k=2$)					8.1%

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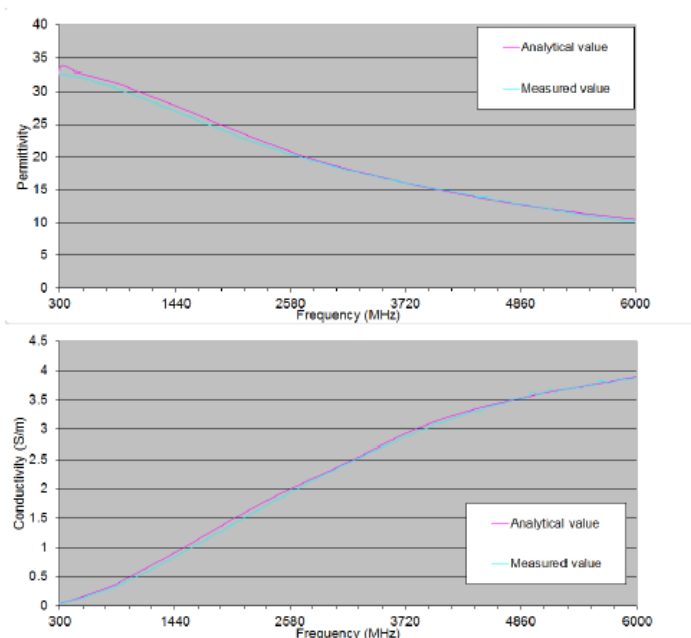
6 CALIBRATION MEASUREMENT RESULTS

Measurement Condition

Software	LIMESAR
Liquid Temperature	21°C
Lab Temperature	21°C
Lab Humidity	44%

6.1 LIQUID PERMITTIVITY MEASUREMENT

A liquid of known characteristics (methanol at 20°C) is measured with the probe and the results (complex permittivity $\epsilon' + j\epsilon''$) are compared with the well-known theoretical values for this liquid.



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7 LIST OF EQUIPMENT

Equipment Summary Sheet				
Equipment Description	Manufacturer / Model	Identification No.	Current Calibration Date	Next Calibration Date
LIMESAR Test Bench	Version 3	NA	Validated. No cal required.	Validated. No cal required.
Network Analyzer	Rhode & Schwarz ZVA	SN100132	02/2024	02/2027
Methanol CAS 67-56-1	Alpha Aesar	Lot D13W011	Validated. No cal required.	Validated. No cal required.
Temperature and Humidity Sensor	Control Company	11-661-9	09/2023	09/2024

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