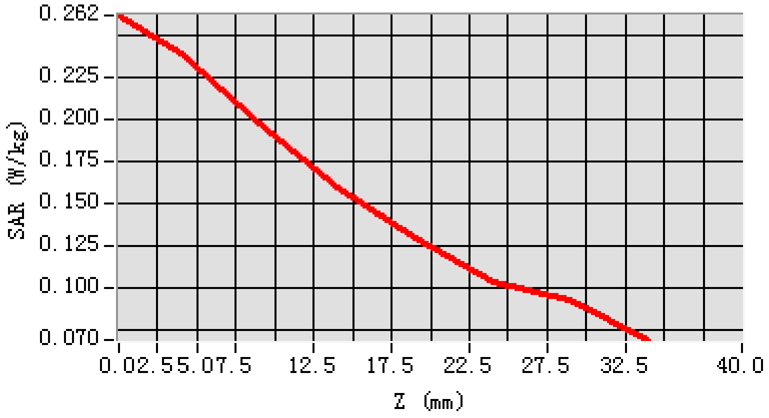
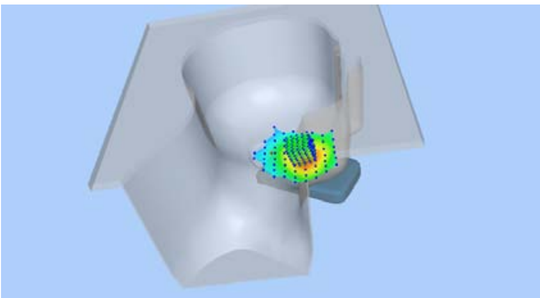
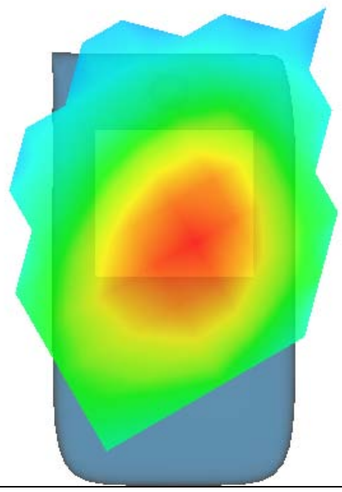
Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.2616	0.2389	0.1978	0.1599	0.1301	0.1038	0.0934



3D screen shot	Hot spot position
	

MEASUREMENT 8

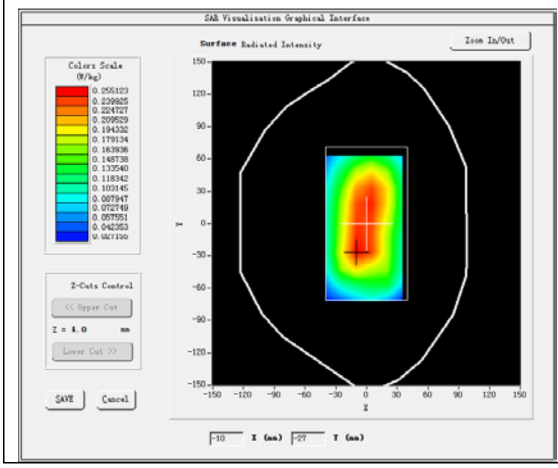
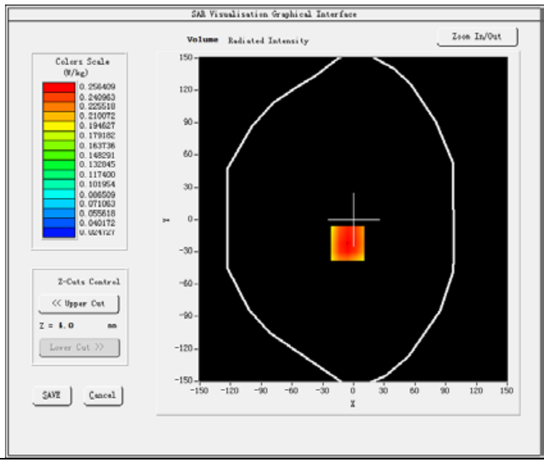
Date of measurement: 24/11/2021

A. Experimental conditions.

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

B. SAR Measurement Results

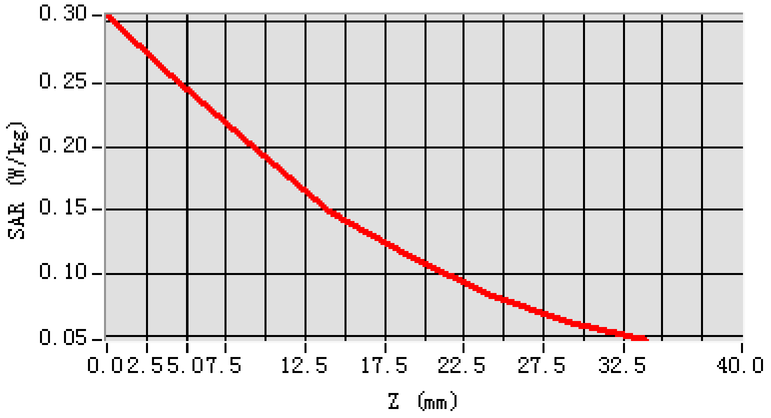
Frequency (MHz)	836.400000
Relative permittivity (real part)	42.557838
Relative permittivity (imaginary part)	20.127096
Conductivity (S/m)	0.935239
Variation (%)	-0.660000

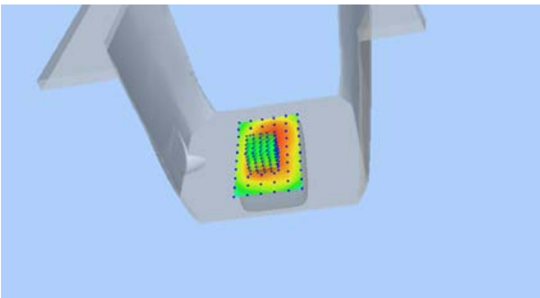
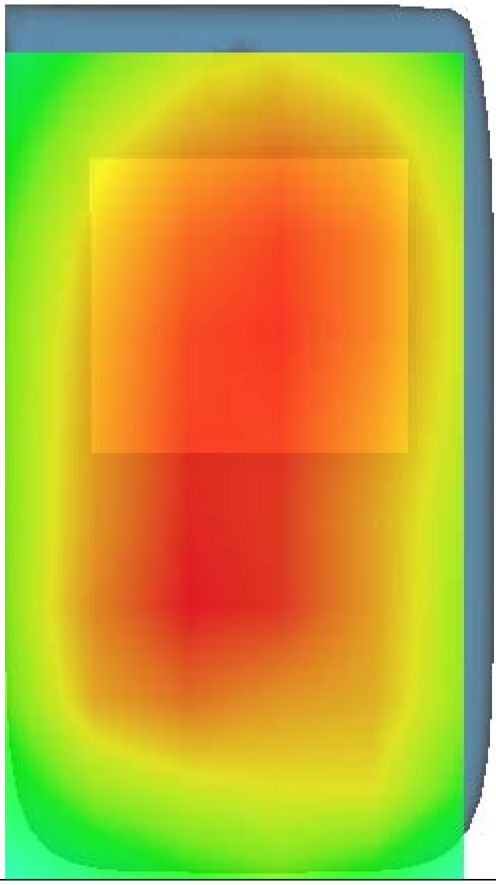
SURFACE SAR	VOLUME SAR
	

Maximum location: X=-6.00, Y=-22.00
SAR Peak: 0.32 W/kg

SAR 10g (W/Kg)	0.186274
SAR 1g (W/Kg)	0.254299

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.3043	0.2564	0.2023	0.1490	0.1141	0.0840	0.0621



3D screen shot	Hot spot position
	

MEASUREMENT 9

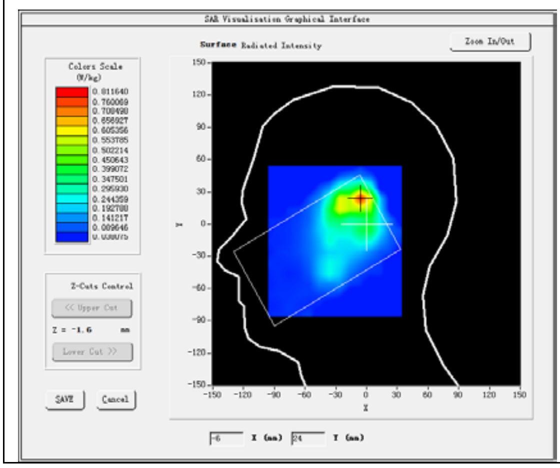
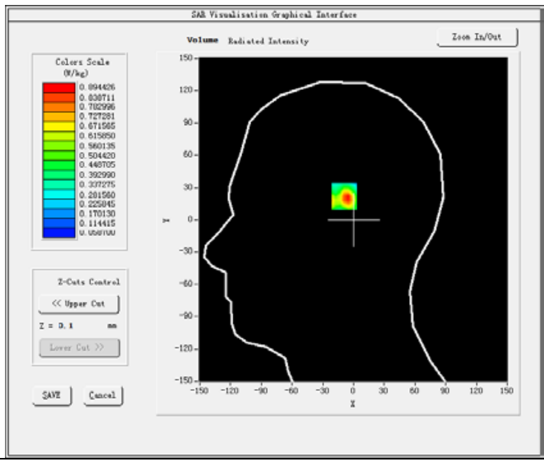
Date of measurement: 30/11/2021

A. Experimental conditions.

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

B. SAR Measurement Results

Frequency (MHz)	5200.000000
Relative permittivity (real part)	37.170158
Relative permittivity (imaginary part)	15.875951
Conductivity (S/m)	4.586386
Variation (%)	-2.220000

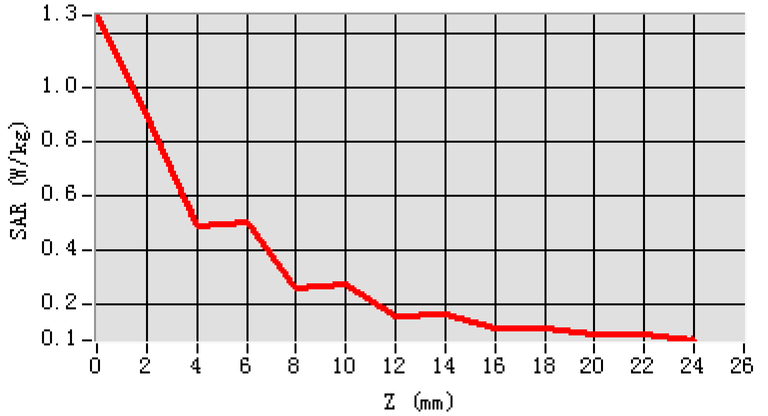
SURFACE SAR	VOLUME SAR
	

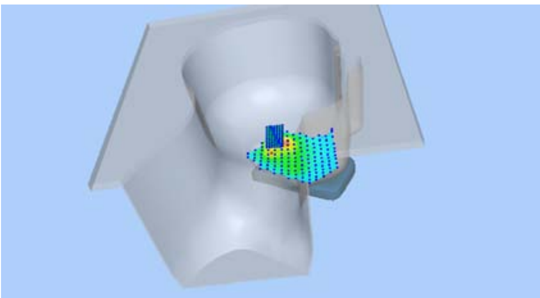
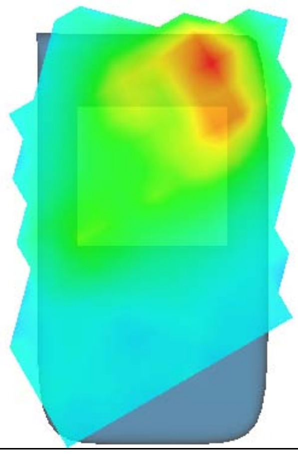
Maximum location: X=-6.00, Y=24.00

SAR Peak: 1.62 W/kg

SAR 10g (W/Kg)	0.349529
SAR 1g (W/Kg)	0.683659

Z (mm)	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)	1.2646	0.8944	0.4824	0.5002	0.2551	0.2698	0.1533	0.1623	0.1071	0.1069	0.0836	0.0827



3D screen shot	Hot spot position
	

MEASUREMENT 10

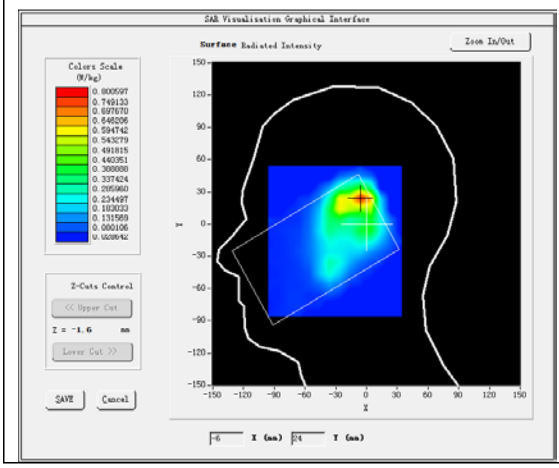
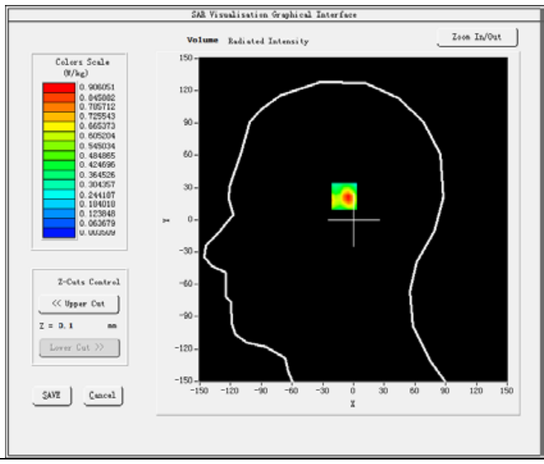
Date of measurement: 2/12/2021

A. Experimental conditions.

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

B. SAR Measurement Results

Frequency (MHz)	5785.000000
Relative permittivity (real part)	36.255207
Relative permittivity (imaginary part)	16.035944
Conductivity (S/m)	5.153774
Variation (%)	-1.000000

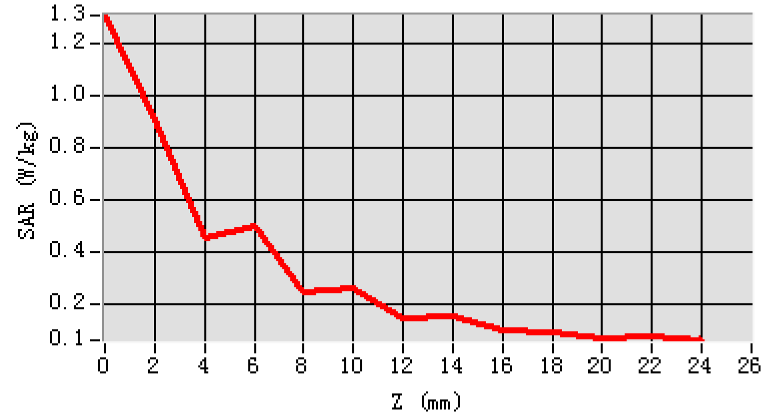
SURFACE SAR	VOLUME SAR
	

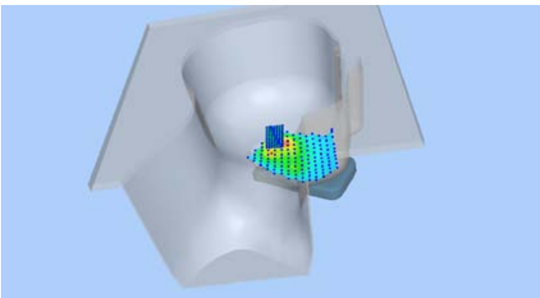
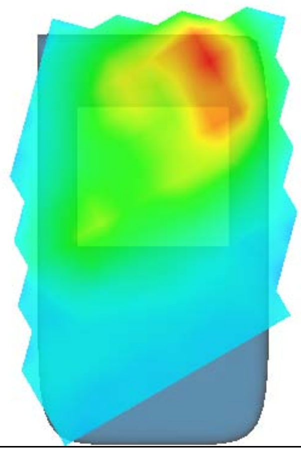
Maximum location: X=-6.00, Y=24.00

SAR Peak: 1.61 W/kg

SAR 10g (W/Kg)	0.344755
SAR 1g (W/Kg)	0.783209

Z (mm)	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)	1.3093	0.9061	0.4501	0.4966	0.2410	0.2554	0.1462	0.1540	0.0973	0.0922	0.0683	0.0704



3D screen shot	Hot spot position
	

MEASUREMENT 11

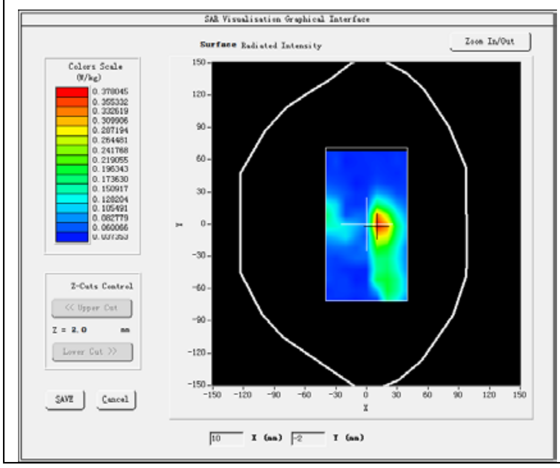
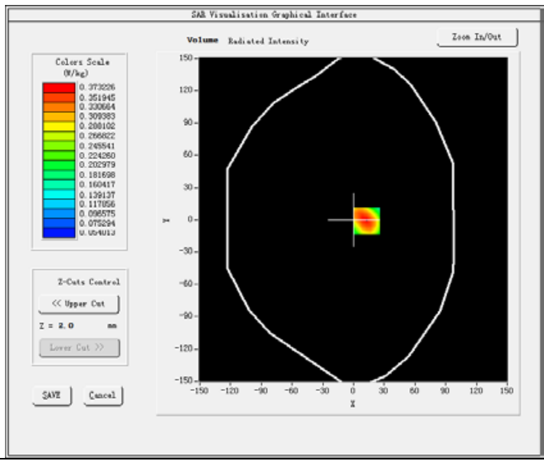
Date of measurement: 30/11/2021

A. Experimental conditions.

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

B. SAR Measurement Results

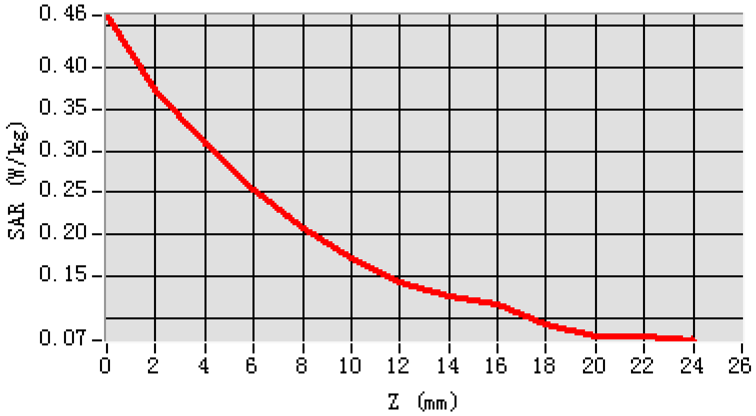
Frequency (MHz)	5200.000000
Relative permittivity (real part)	37.170158
Relative permittivity (imaginary part)	15.875951
Conductivity (S/m)	4.586386
Variation (%)	1.890000

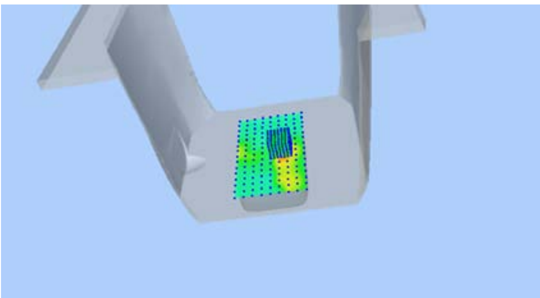
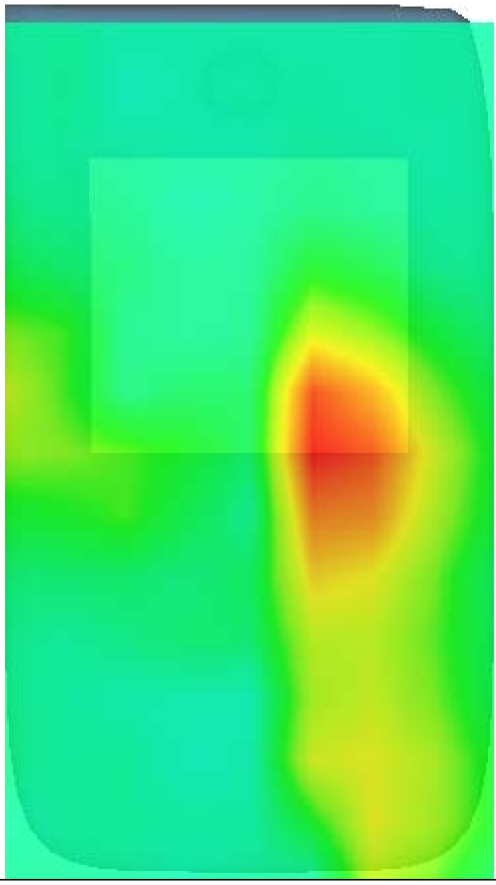
SURFACE SAR	VOLUME SAR
	

Maximum location: X=13.00, Y=-1.00
SAR Peak: 0.46 W/kg

SAR 10g (W/Kg)	0.177146
SAR 1g (W/Kg)	0.288864

Z (mm)	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)	0.4610	0.3732	0.3094	0.2541	0.2082	0.1714	0.1450	0.1282	0.1186	0.0949	0.0795	0.0804



3D screen shot	Hot spot position
	

MEASUREMENT 12

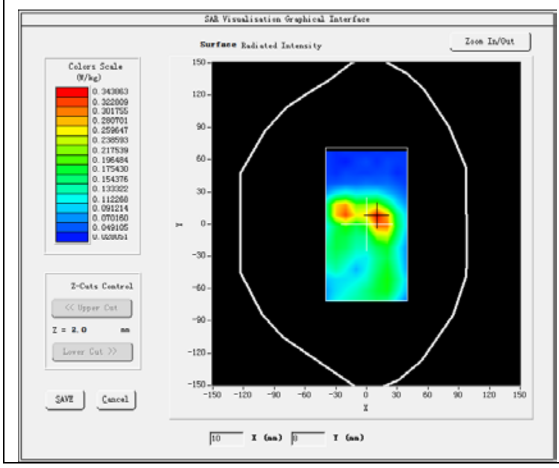
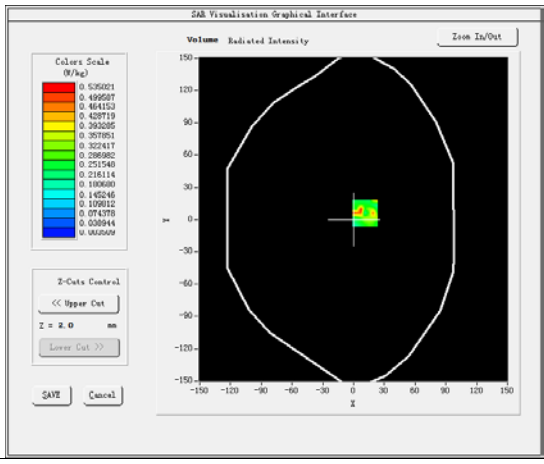
Date of measurement: 2/12/2021

A. Experimental conditions.

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

B. SAR Measurement Results

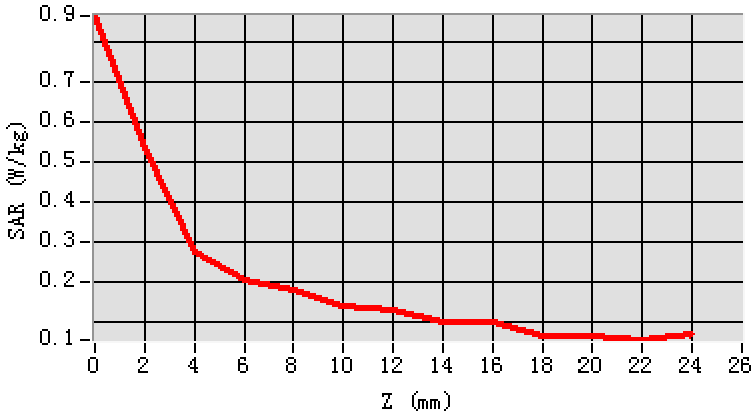
Frequency (MHz)	5785.000000
Relative permittivity (real part)	36.255207
Relative permittivity (imaginary part)	16.035944
Conductivity (S/m)	5.153774
Variation (%)	-3.870000

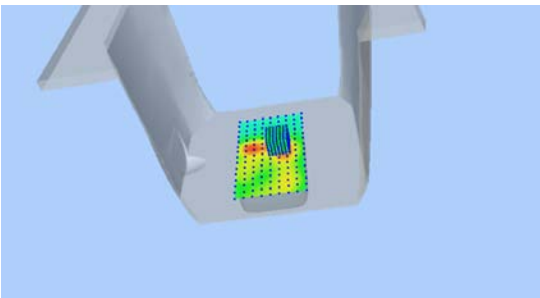
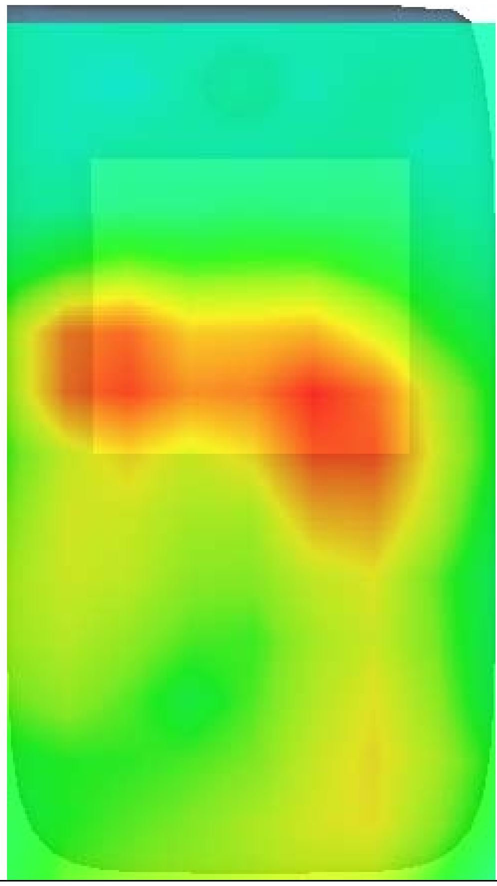
SURFACE SAR	VOLUME SAR
	

Maximum location: X=11.00, Y=6.00
SAR Peak: 0.93 W/kg

SAR 10g (W/Kg)	0.160531
SAR 1g (W/Kg)	0.291786

Z (mm)	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)	0.8631	0.5350	0.2716	0.2044	0.1767	0.1395	0.1305	0.0983	0.0971	0.0652	0.0615	0.0539



3D screen shot	Hot spot position
	

MEASUREMENT 13

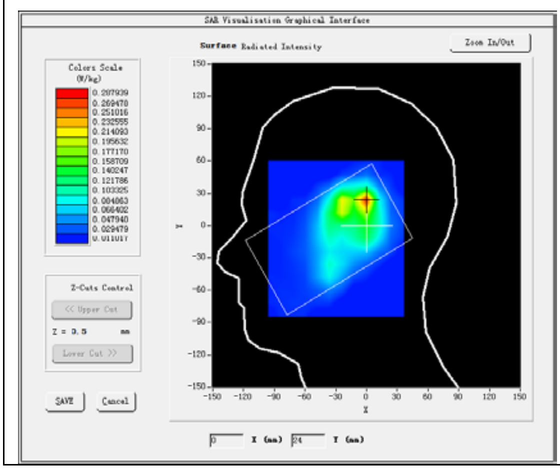
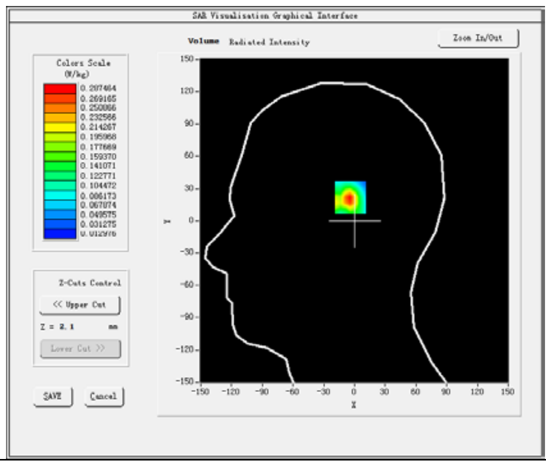
Date of measurement: 27/11/2021

A. Experimental conditions.

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

B. SAR Measurement Results

Frequency (MHz)	2437.000000
Relative permittivity (real part)	40.560249
Relative permittivity (imaginary part)	13.097354
Conductivity (S/m)	1.773236
Variation (%)	-2.330000

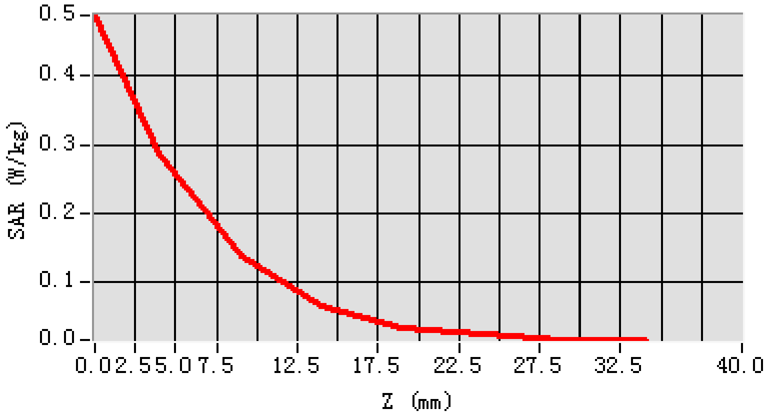
SURFACE SAR	VOLUME SAR
	

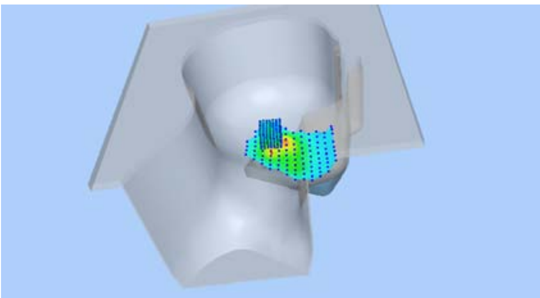
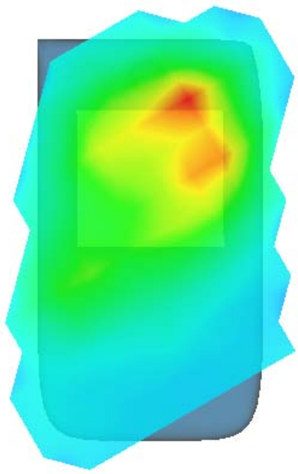
Maximum location: X=-1.00, Y=23.00

SAR Peak: 0.51 W/kg

SAR 10g (W/Kg)	0.116654
SAR 1g (W/Kg)	0.259986

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.4888	0.2875	0.1394	0.0657	0.0336	0.0267	0.0182



3D screen shot	Hot spot position
	

MEASUREMENT 14

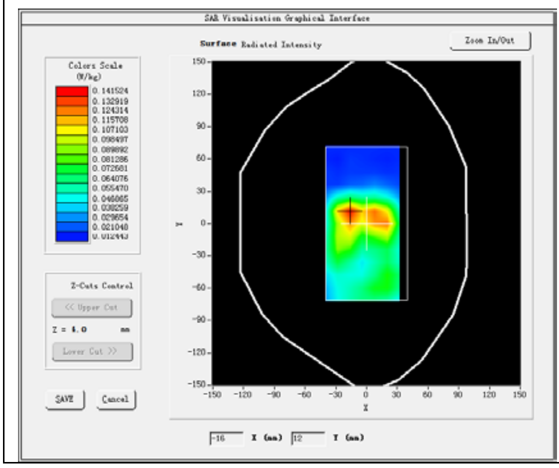
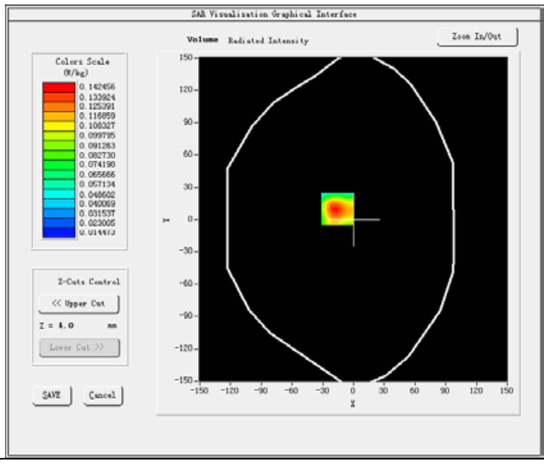
Date of measurement: 27/11/2021

A. Experimental conditions.

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

B. SAR Measurement Results

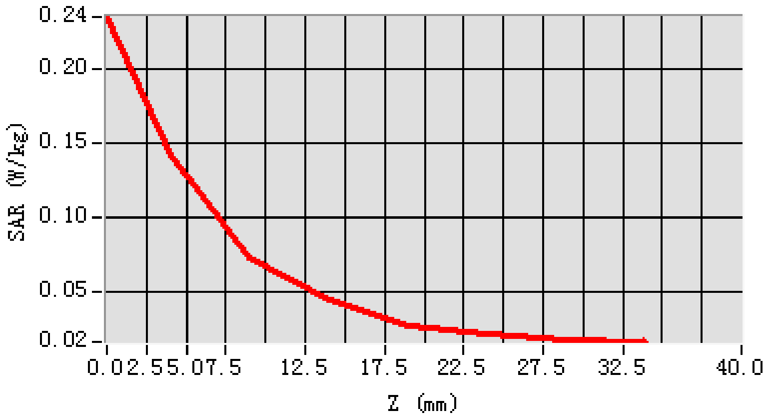
Frequency (MHz)	2437.000000
Relative permittivity (real part)	40.560249
Relative permittivity (imaginary part)	13.097354
Conductivity (S/m)	1.773236
Variation (%)	-3.420000

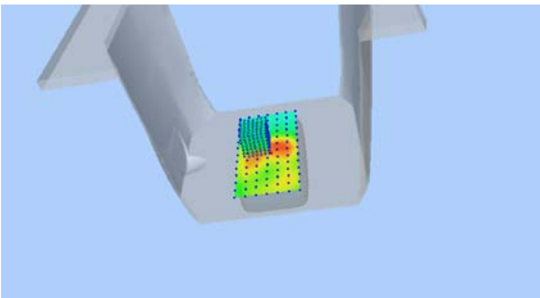
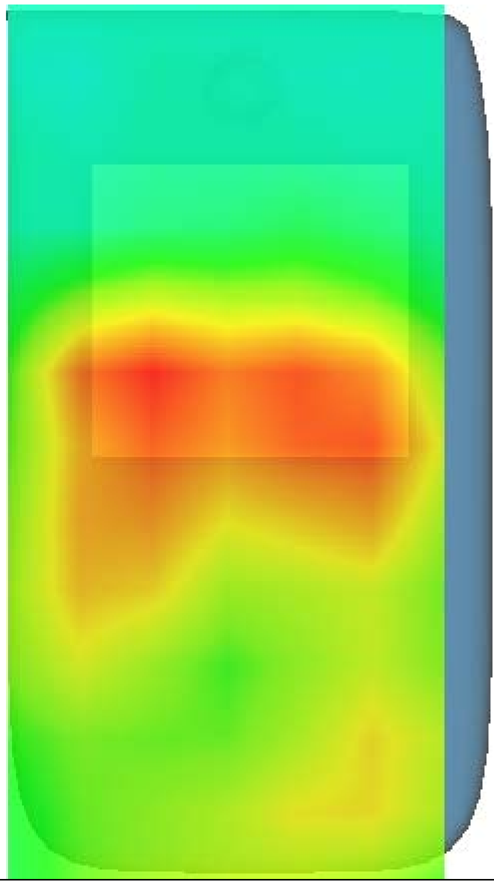
SURFACE SAR	VOLUME SAR
	

Maximum location: X=-16.00, Y=10.00
SAR Peak: 0.24 W/kg

SAR 10g (W/Kg)	0.073135
SAR 1g (W/Kg)	0.134580

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.2351	0.1425	0.0739	0.0446	0.0269	0.0218	0.0183



3D screen shot	Hot spot position
	

MEASUREMENT 15

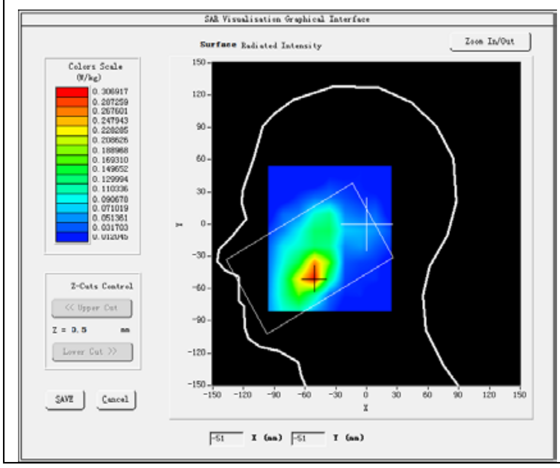
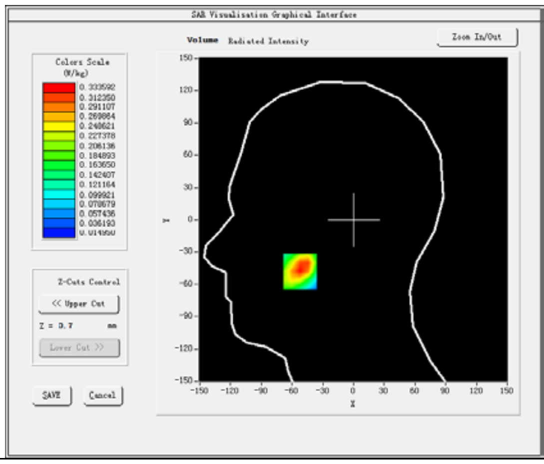
Date of measurement: 23/11/2021

A. Experimental conditions.

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

B. SAR Measurement Results

Frequency (MHz)	1880.000000
Relative permittivity (real part)	38.853828
Relative permittivity (imaginary part)	13.876945
Conductivity (S/m)	1.449370
Variation (%)	0.350000

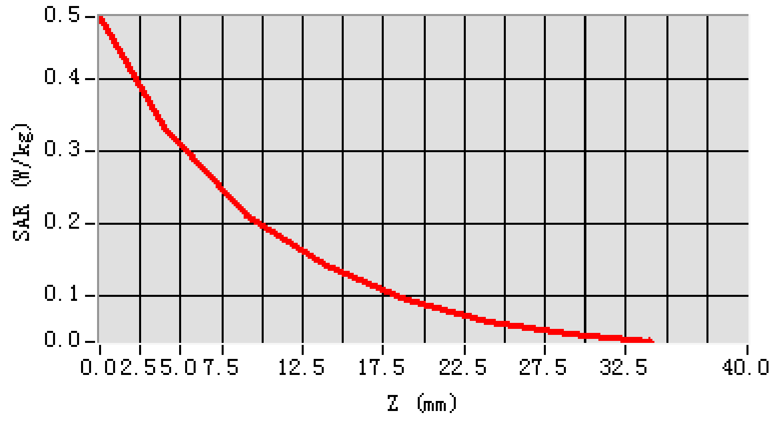
SURFACE SAR	VOLUME SAR
	

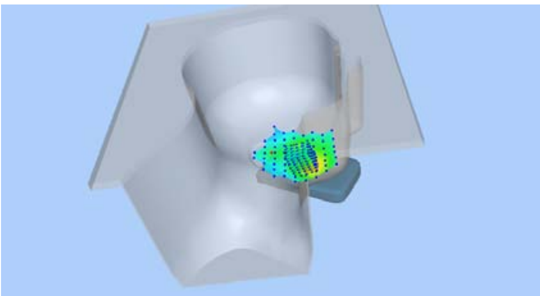
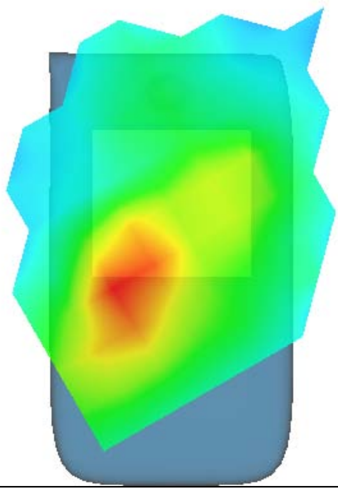
Maximum location: X=-52.00, Y=-48.00

SAR Peak: 0.52 W/kg

SAR 10g (W/Kg)	0.183698
SAR 1g (W/Kg)	0.332164

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.4859	0.3336	0.2102	0.1403	0.0947	0.0629	0.0457



3D screen shot	Hot spot position
	

MEASUREMENT 16

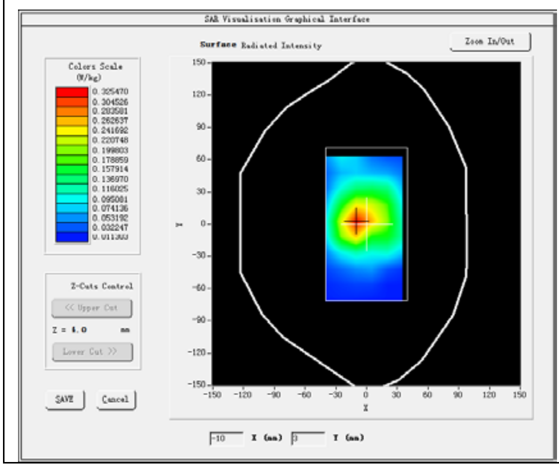
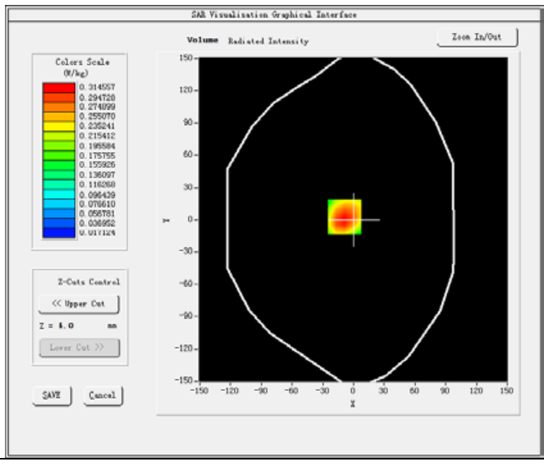
Date of measurement: 23/11/2021

A. Experimental conditions.

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

B. SAR Measurement Results

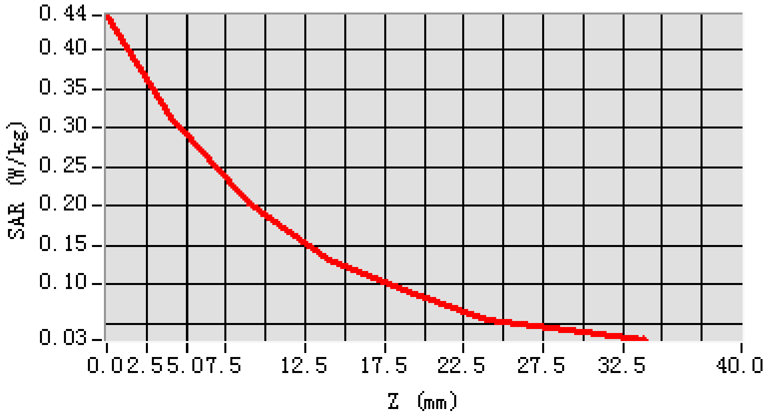
Frequency (MHz)	1880.000000
Relative permittivity (real part)	38.853828
Relative permittivity (imaginary part)	13.876945
Conductivity (S/m)	1.449370
Variation (%)	-0.610000

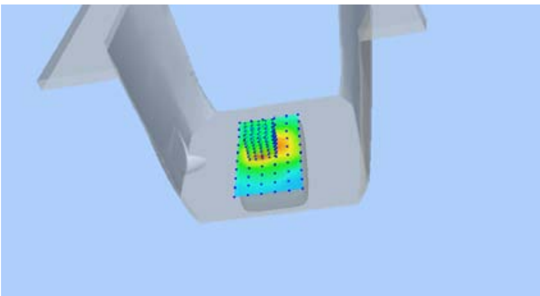
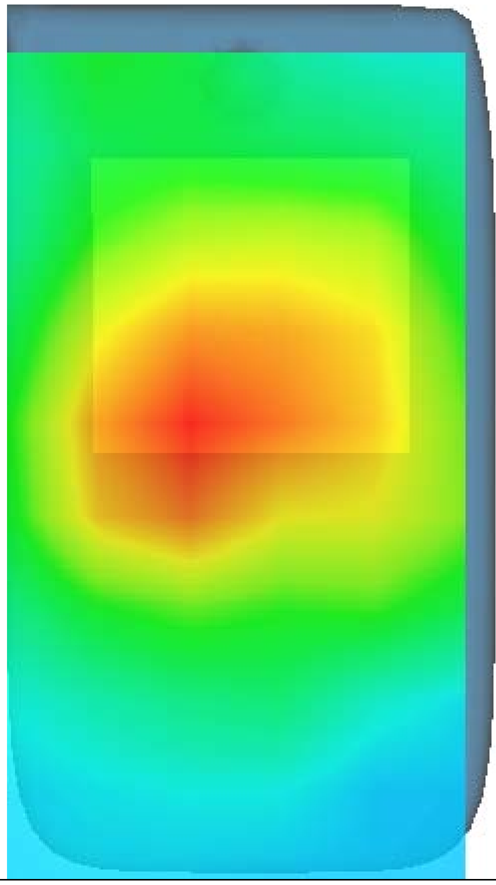
SURFACE SAR	VOLUME SAR
	

Maximum location: X=-9.00, Y=3.00
SAR Peak: 0.46 W/kg

SAR 10g (W/Kg)	0.186881
SAR 1g (W/Kg)	0.313433

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.4437	0.3146	0.2031	0.1320	0.0908	0.0556	0.0428



3D screen shot	Hot spot position
	

MEASUREMENT 17

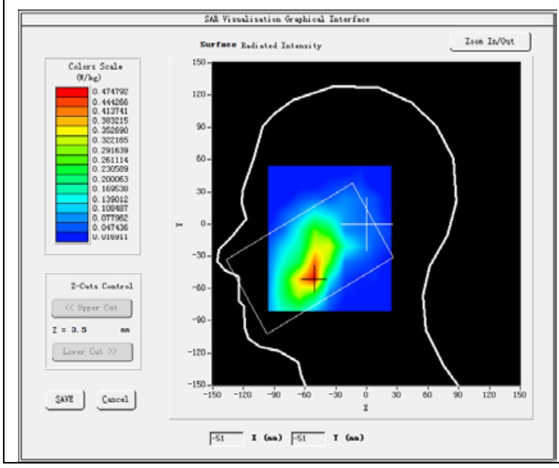
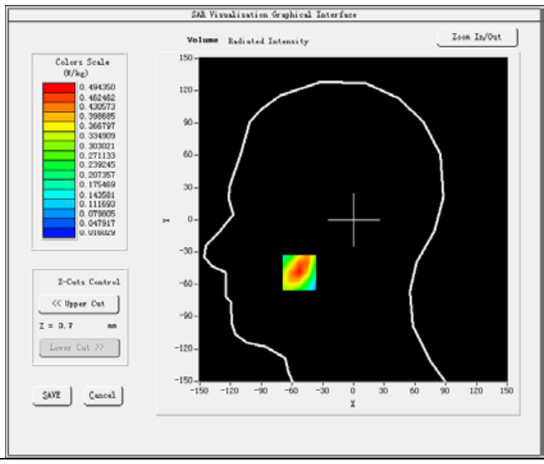
Date of measurement: 26/11/2021

A. Experimental conditions.

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

B. SAR Measurement Results

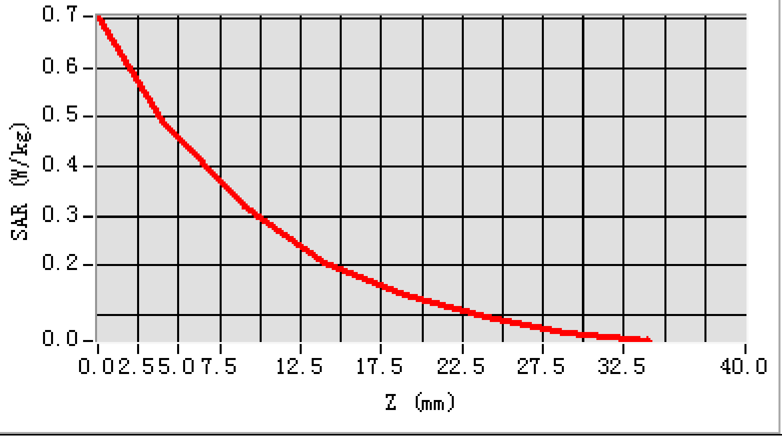
Frequency (MHz)	1732.500000
Relative permittivity (real part)	39.607807
Relative permittivity (imaginary part)	13.965677
Conductivity (S/m)	1.344196
Variation (%)	0.550000

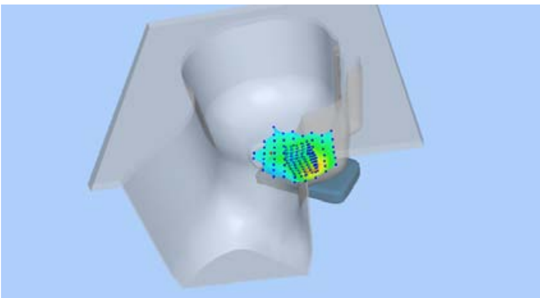
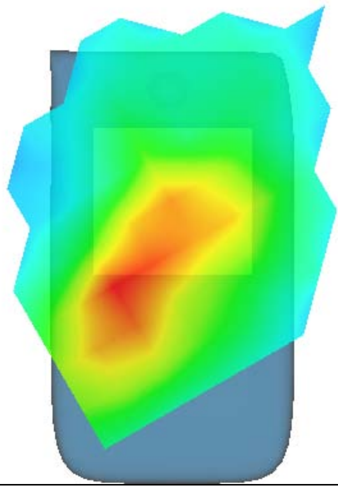
SURFACE SAR	VOLUME SAR
	

Maximum location: X=-53.00, Y=-49.00
SAR Peak: 0.73 W/kg

SAR 10g (W/Kg)	0.274269
SAR 1g (W/Kg)	0.466305

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.7050	0.4944	0.3197	0.2033	0.1397	0.0964	0.0644



3D screen shot	Hot spot position
	

MEASUREMENT 18

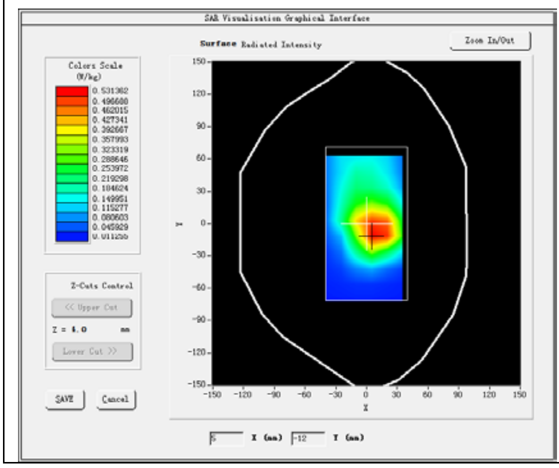
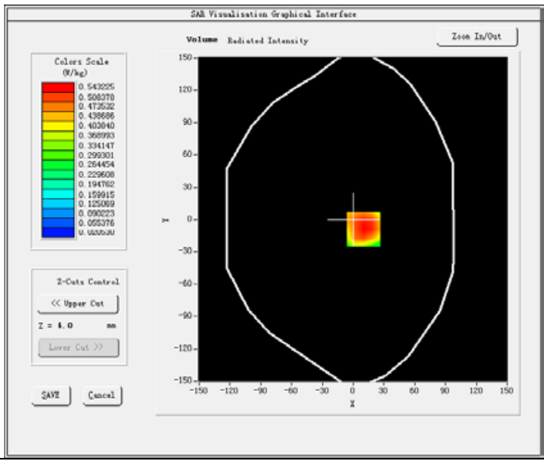
Date of measurement: 26/11/2021

A. Experimental conditions.

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

B. SAR Measurement Results

Frequency (MHz)	1732.500000
Relative permittivity (real part)	39.607807
Relative permittivity (imaginary part)	13.965677
Conductivity (S/m)	1.344196
Variation (%)	-0.950000

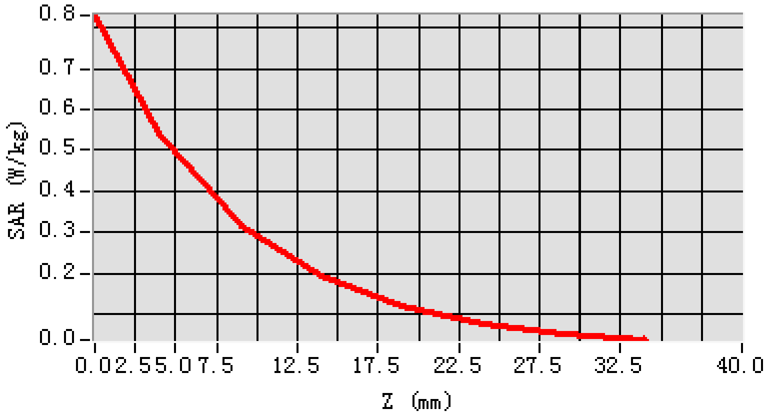
SURFACE SAR	VOLUME SAR
	

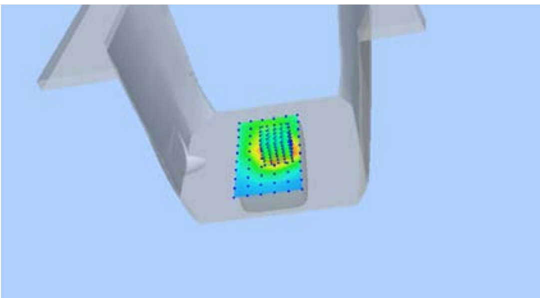
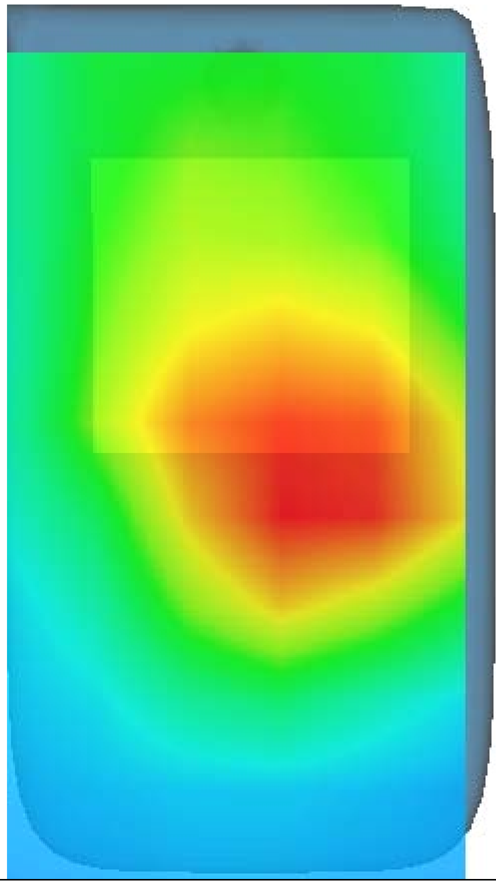
Maximum location: X=10.00, Y=-9.00

SAR Peak: 0.84 W/kg

SAR 10g (W/Kg)	0.319829
SAR 1g (W/Kg)	0.530594

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.8300	0.5432	0.3176	0.1910	0.1186	0.0776	0.0495



3D screen shot	Hot spot position
	

MEASUREMENT 19

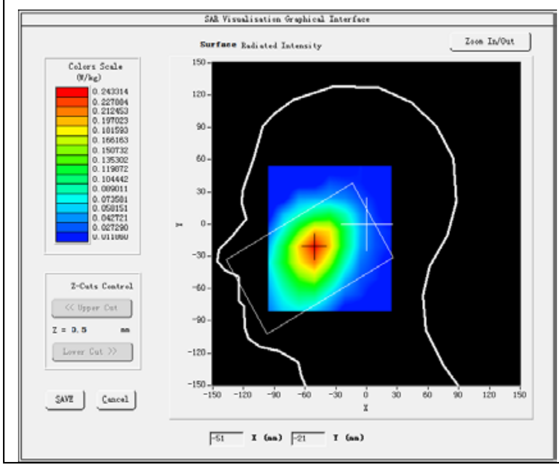
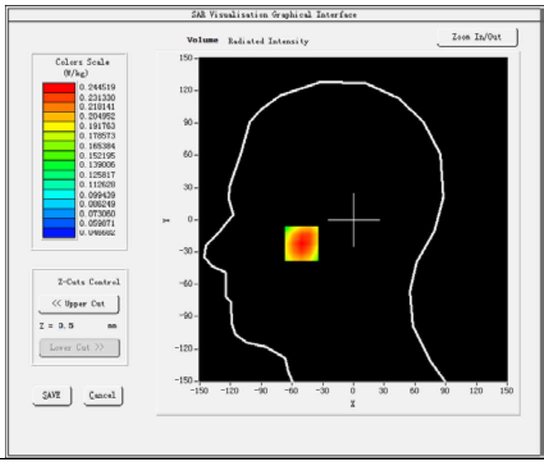
Date of measurement: 24/11/2021

A. Experimental conditions.

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

B. SAR Measurement Results

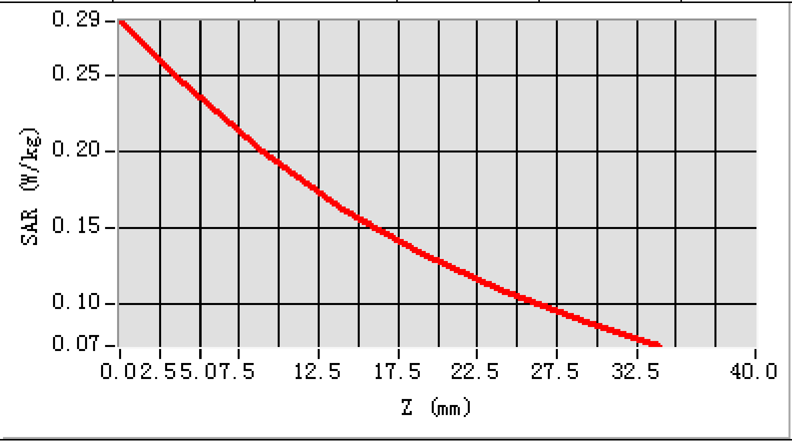
Frequency (MHz)	836.500000
Relative permittivity (real part)	42.560429
Relative permittivity (imaginary part)	20.125757
Conductivity (S/m)	0.935289
Variation (%)	-1.390000

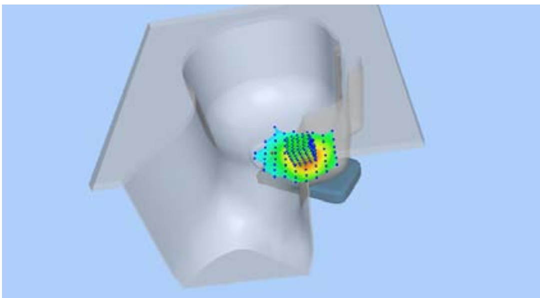
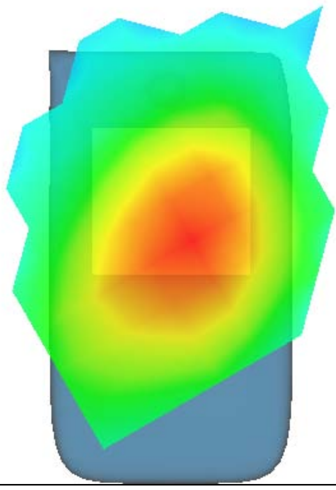
SURFACE SAR	VOLUME SAR
	

Maximum location: X=-51.00, Y=-22.00
SAR Peak: 0.29 W/kg

SAR 10g (W/Kg)	0.181407
SAR 1g (W/Kg)	0.240568

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.2857	0.2445	0.2001	0.1624	0.1332	0.1092	0.0897



3D screen shot	Hot spot position
	

MEASUREMENT 20

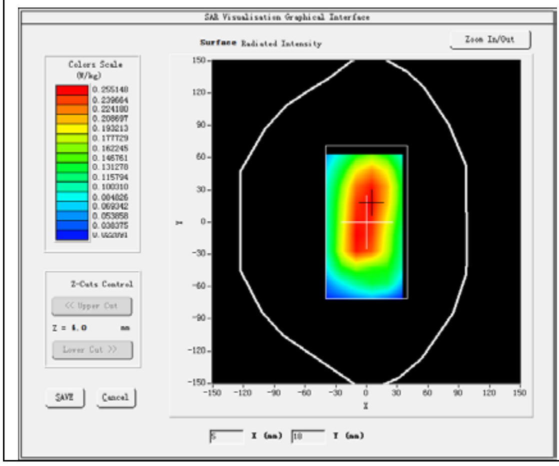
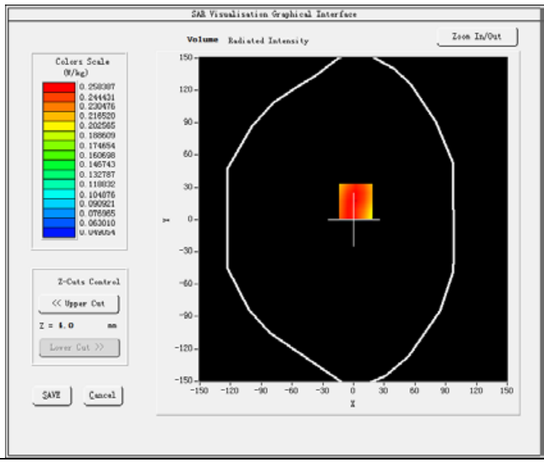
Date of measurement: 24/11/2021

A. Experimental conditions.

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

B. SAR Measurement Results

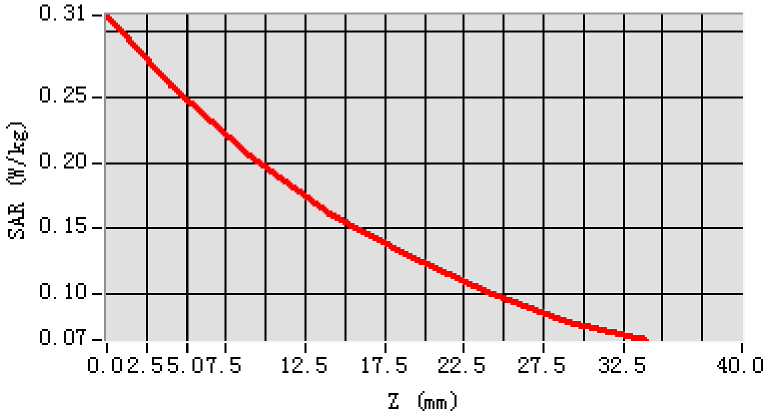
Frequency (MHz)	836.500000
Relative permittivity (real part)	42.560429
Relative permittivity (imaginary part)	20.125757
Conductivity (S/m)	0.935289
Variation (%)	-1.460000

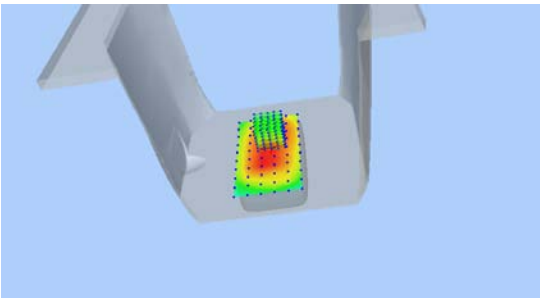
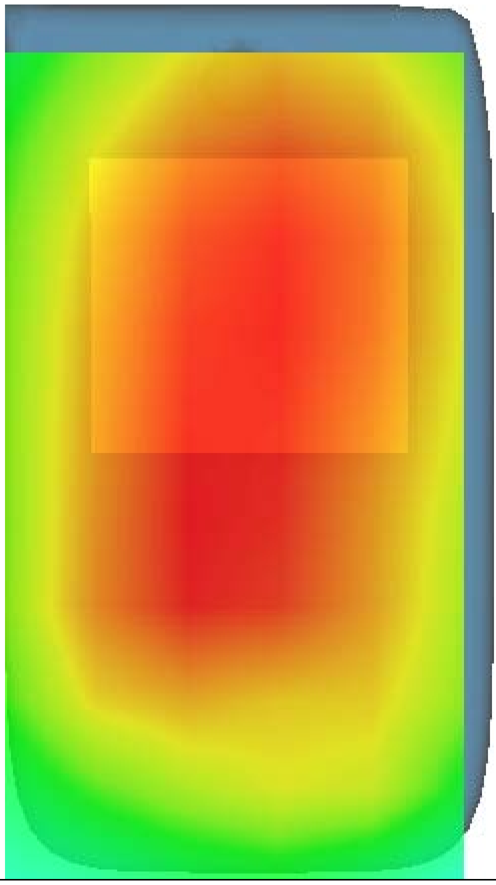
SURFACE SAR	VOLUME SAR
	

Maximum location: X=2.00, Y=17.00
SAR Peak: 0.32 W/kg

SAR 10g (W/Kg)	0.194717
SAR 1g (W/Kg)	0.259128

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.3121	0.2584	0.2056	0.1621	0.1287	0.1020	0.0794



3D screen shot	Hot spot position
	

MEASUREMENT 21

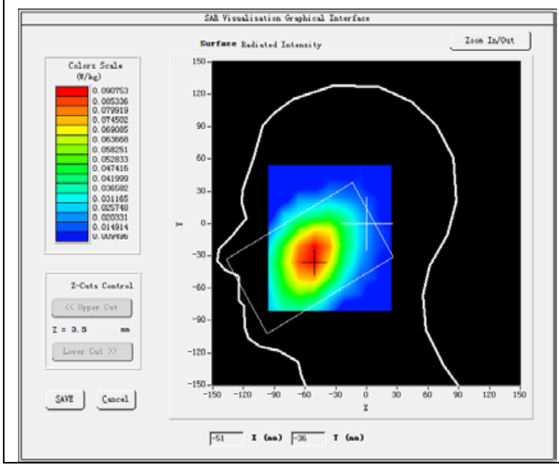
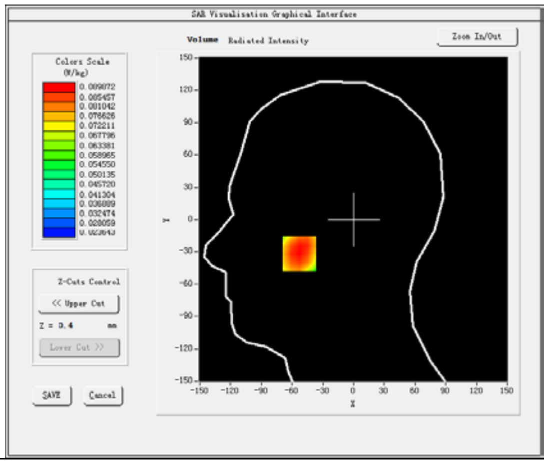
Date of measurement: 25/11/2021

A. Experimental conditions.

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

B. SAR Measurement Results

Frequency (MHz)	707.500000
Relative permittivity (real part)	42.550629
Relative permittivity (imaginary part)	21.736059
Conductivity (S/m)	0.854348
Variation (%)	-3.820000

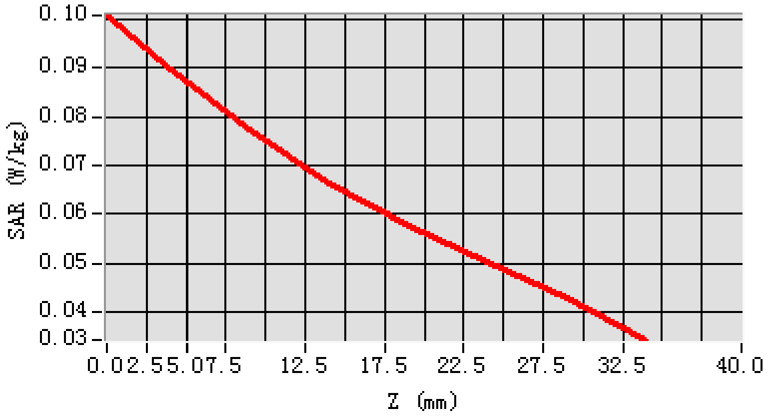
SURFACE SAR	**VOLUME SAR**
	

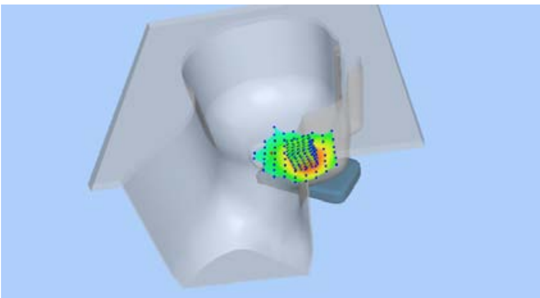
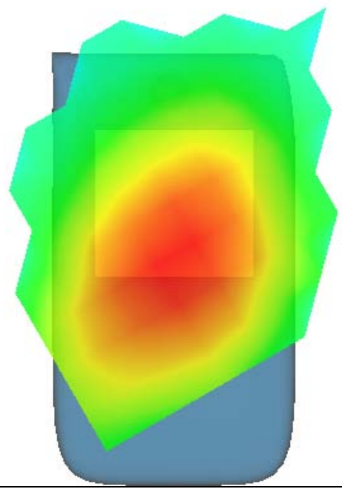
Maximum location: X=-53.00, Y=-32.00

SAR Peak: 0.10 W/kg

SAR 10g (W/Kg)	0.071647
SAR 1g (W/Kg)	0.087764

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.1009	0.0899	0.0773	0.0664	0.0576	0.0505	0.0430



3D screen shot	Hot spot position
	

MEASUREMENT 22

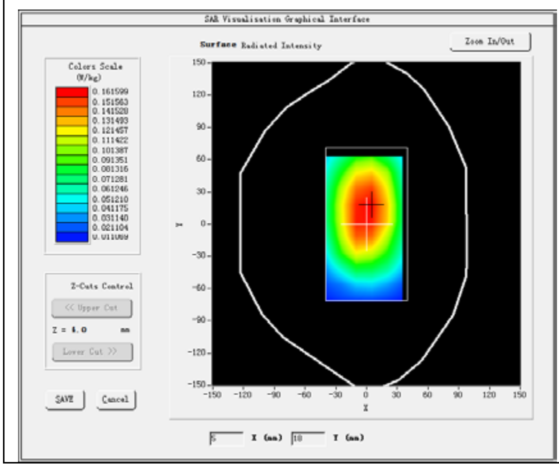
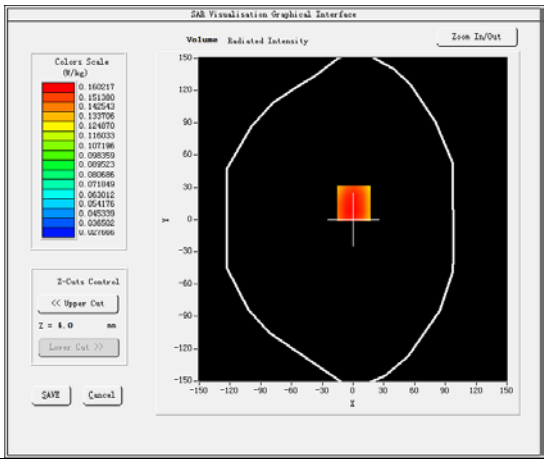
Date of measurement: 25/11/2021

A. Experimental conditions.

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

B. SAR Measurement Results

Frequency (MHz)	707.500000
Relative permittivity (real part)	42.550629
Relative permittivity (imaginary part)	21.736059
Conductivity (S/m)	0.854348
Variation (%)	-3.310000

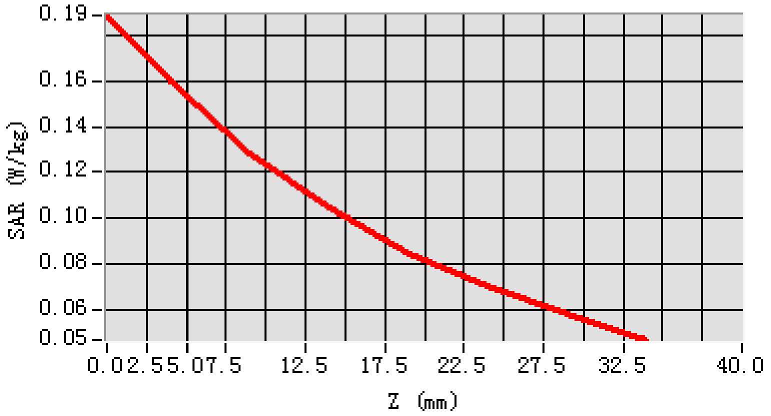
SURFACE SAR	VOLUME SAR
	

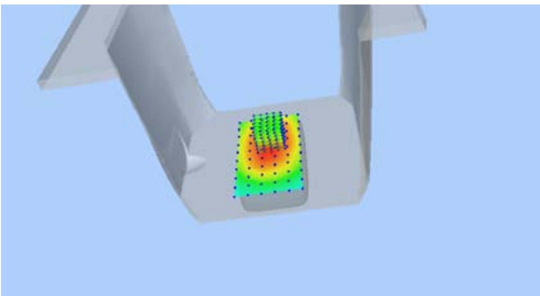
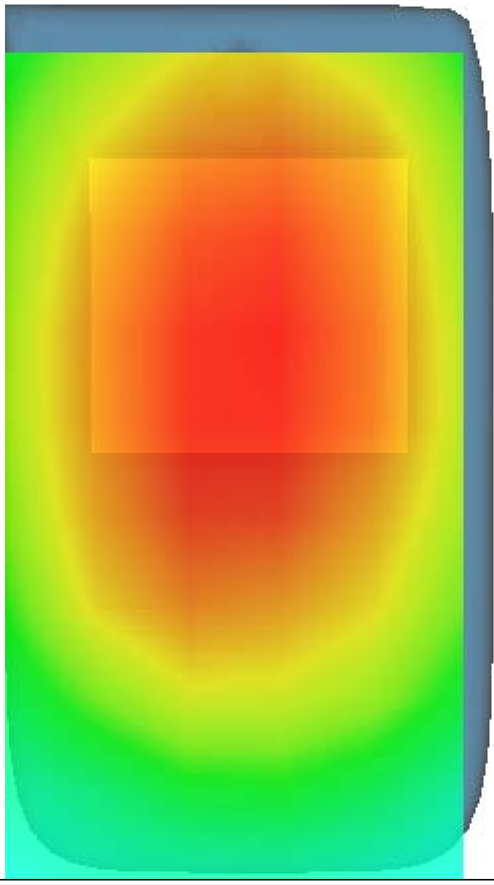
Maximum location: X=1.00, Y=15.00

SAR Peak: 0.21 W/kg

SAR 10g (W/Kg)	0.121859
SAR 1g (W/Kg)	0.152703

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.1890	0.1602	0.1285	0.1047	0.0840	0.0700	0.0583



3D screen shot	Hot spot position
	

MEASUREMENT 23

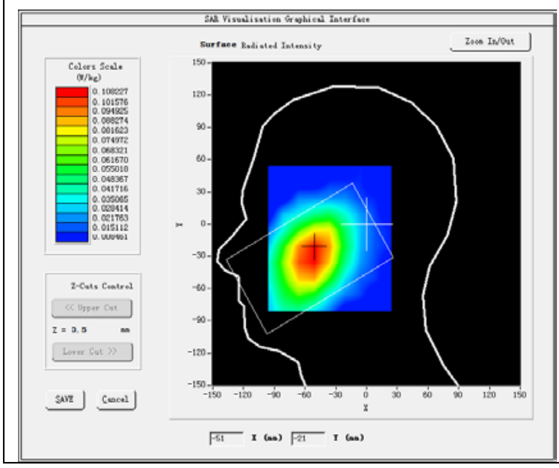
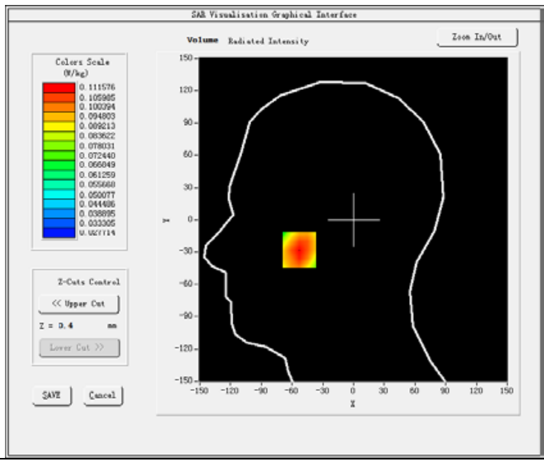
Date of measurement: 25/11/2021

A. Experimental conditions.

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

B. SAR Measurement Results

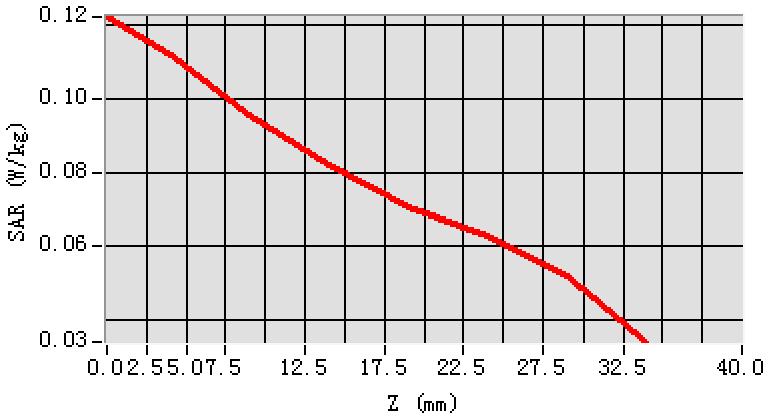
Frequency (MHz)	710.000000
Relative permittivity (real part)	42.535278
Relative permittivity (imaginary part)	21.676510
Conductivity (S/m)	0.855018
Variation (%)	-2.310000

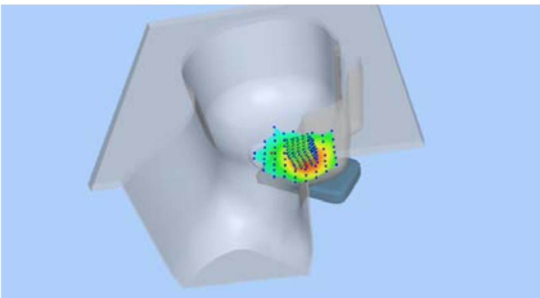
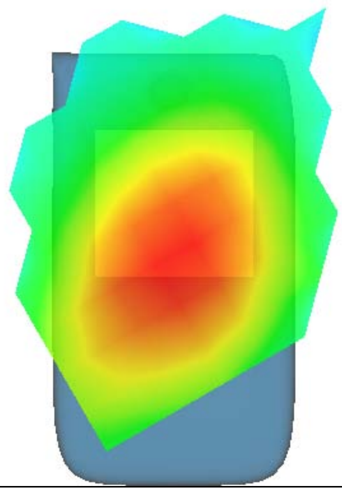
SURFACE SAR	VOLUME SAR
	

Maximum location: X=-53.00, Y=-28.00
SAR Peak: 0.13 W/kg

SAR 10g (W/Kg)	0.086739
SAR 1g (W/Kg)	0.106405

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.1222	0.1116	0.0958	0.0820	0.0705	0.0628	0.0523



3D screen shot	Hot spot position
	

MEASUREMENT 24

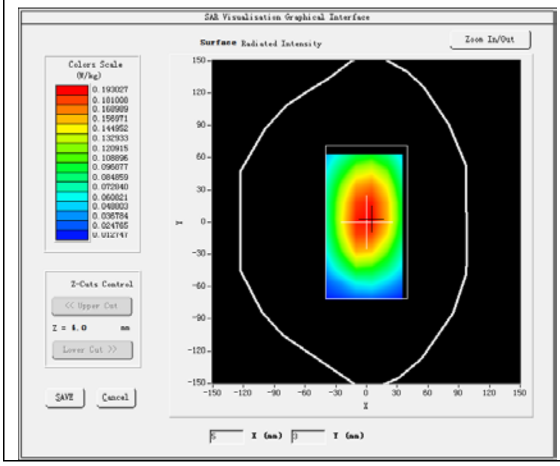
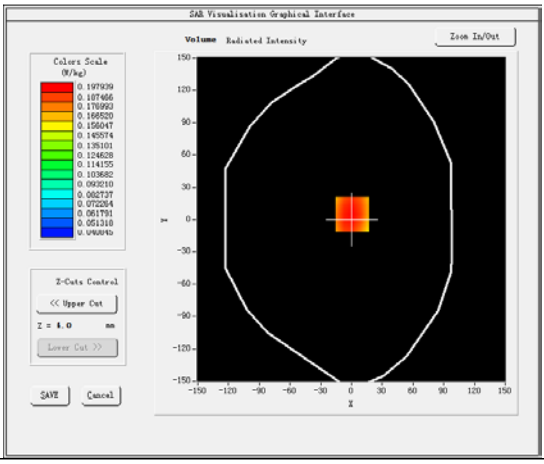
Date of measurement: 25/11/2021

A. Experimental conditions.

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

B. SAR Measurement Results

Frequency (MHz)	710.000000
Relative permittivity (real part)	42.535278
Relative permittivity (imaginary part)	21.676510
Conductivity (S/m)	0.855018
Variation (%)	-0.240000

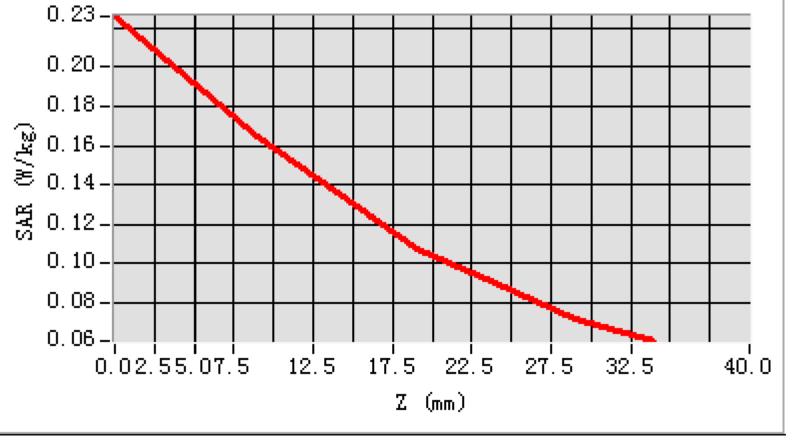
SURFACE SAR	VOLUME SAR
	

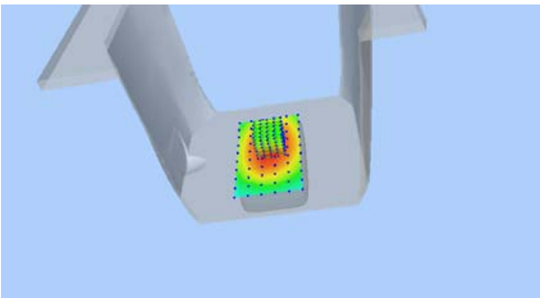
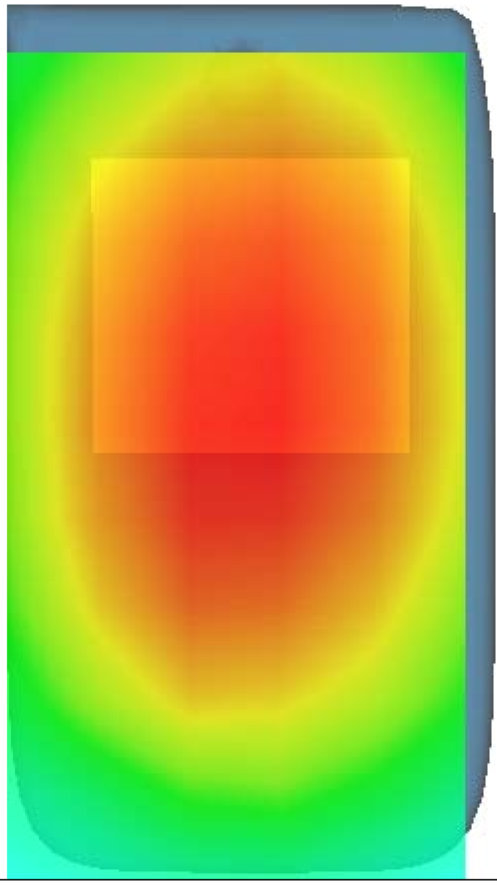
Maximum location: X=1.00, Y=5.00

SAR Peak: 0.23 W/kg

SAR 10g (W/Kg)	0.152796
SAR 1g (W/Kg)	0.192360

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.2259	0.1979	0.1645	0.1366	0.1078	0.0902	0.0715



3D screen shot	Hot spot position
	

MEASUREMENT 25

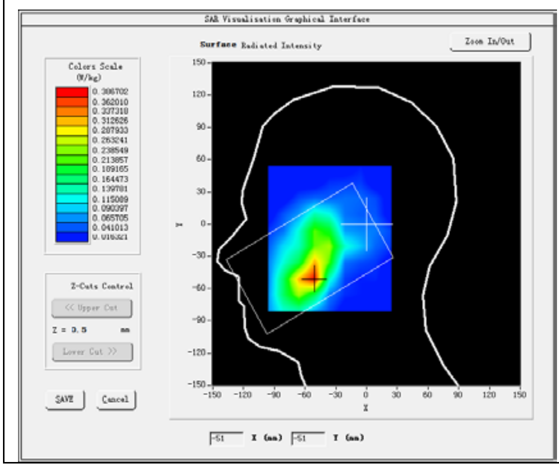
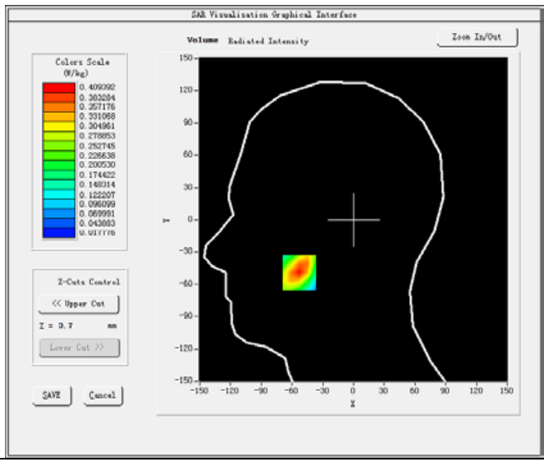
Date of measurement: 26/11/2021

A. Experimental conditions.

Area Scan	dx=15mm dy=15mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm
Phantom	Left head
Device Position	Cheek
Band	LTE band 66
Channels	Middle
Signal	LTE (Crest factor: 1.0)

B. SAR Measurement Results

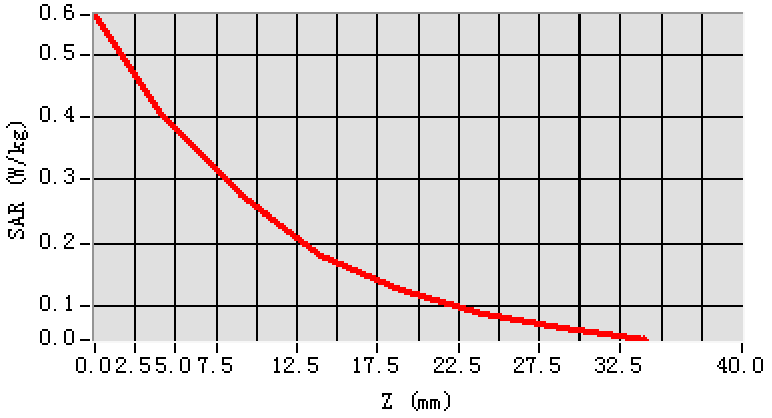
Frequency (MHz)	1745.000000
Relative permittivity (real part)	39.536007
Relative permittivity (imaginary part)	13.963227
Conductivity (S/m)	1.353657
Variation (%)	-1.570000

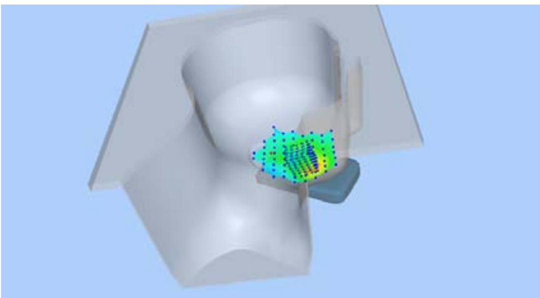
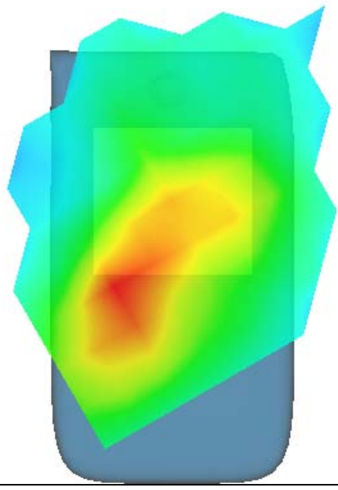
SURFACE SAR	VOLUME SAR
	

Maximum location: X=-53.00, Y=-49.00
SAR Peak: 0.58 W/kg

SAR 10g (W/Kg)	0.230021
SAR 1g (W/Kg)	0.383615

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.5629	0.4094	0.2747	0.1793	0.1263	0.0887	0.0639



3D screen shot	Hot spot position
	

MEASUREMENT 26

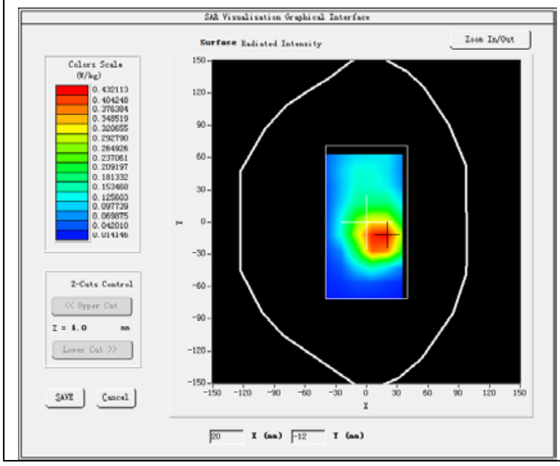
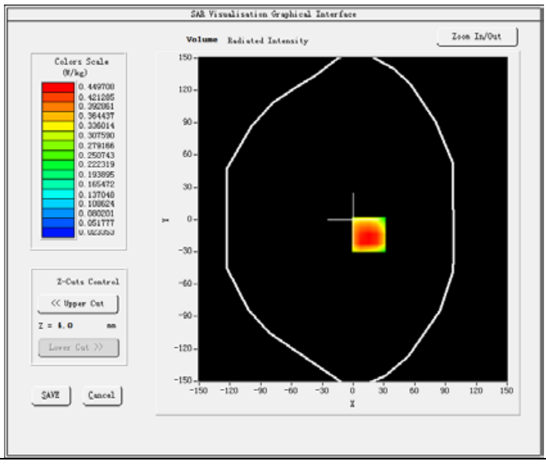
Date of measurement: 26/11/2021

A. Experimental conditions.

Area Scan	dx=15mm dy=15mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm
Phantom	Validation plane
Device Position	Body
Band	LTE band 66
Channels	Middle
Signal	LTE (Crest factor: 1.0)

B. SAR Measurement Results

Frequency (MHz)	1745.000000
Relative permittivity (real part)	39.536007
Relative permittivity (imaginary part)	13.963227
Conductivity (S/m)	1.353657
Variation (%)	0.010000

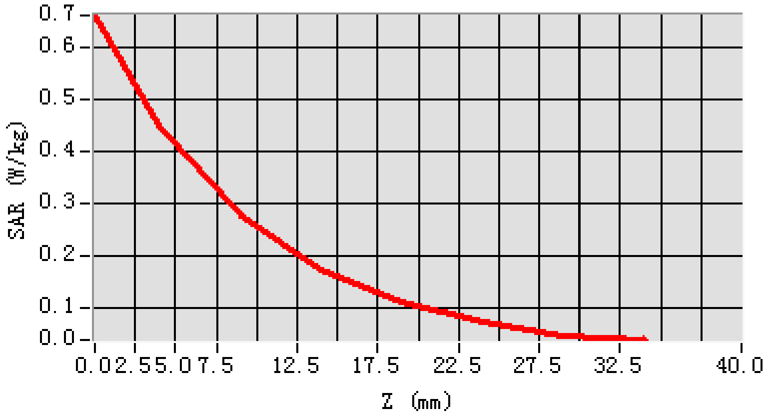
SURFACE SAR	VOLUME SAR
	

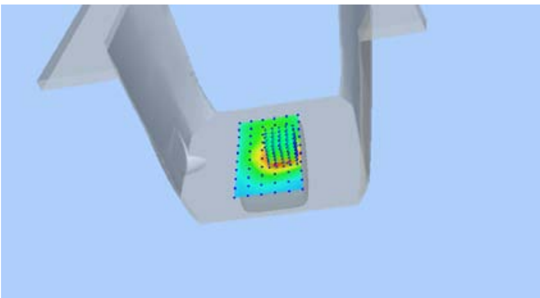
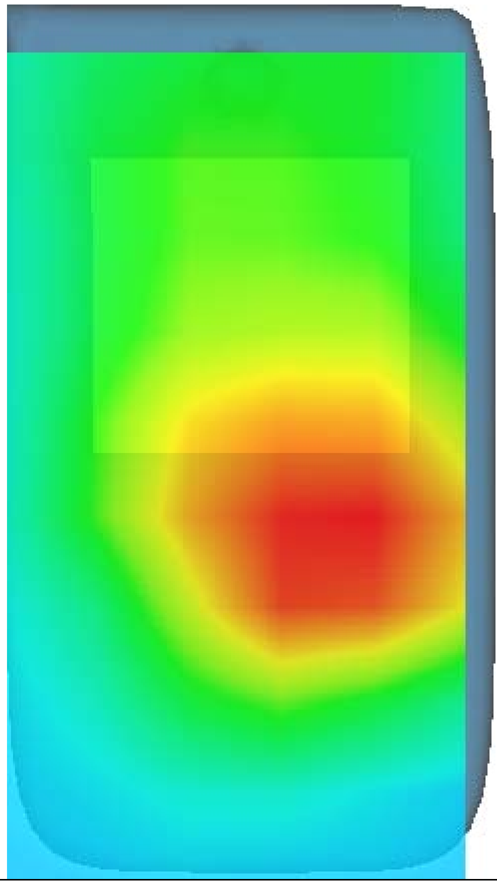
Maximum location: X=15.00, Y=-14.00

SAR Peak: 0.72 W/kg

SAR 10g (W/Kg)	0.268313
SAR 1g (W/Kg)	0.446862

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.6604	0.4497	0.2782	0.1734	0.1112	0.0734	0.0477



3D screen shot	Hot spot position
	

14. Appendix D. Calibration Certificate

Table of contents
E Field Probe - SN 08/16 EPGO287
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
5000-6000 MHz Dipole - SN 13/14 WGA 33

COMOSAR E-Field Probe Calibration Report

Ref : ACR.60.1.21.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 DOSIMETRIC E-FIELD PROBE
SERIAL NO.: SN 08/16 EPGO287

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 COMOSAR 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.60.1.21.MVGB.A

	Name	*Function*	*Date*	*Signature*
Prepared by :	Jérôme Luc	Technical Manager	3/1/2021	JS
Checked by :	Jérôme Luc	Technical Manager	3/1/2021	JS
Approved by :	Yann Toutain	Laboratory Director	3/1/2021	Yann Toutain

Mode d'emploi 2021.03.01 13:07:12 +01'00'

PHILIPS

	Customer Name
Distribution :	SHENZHEN NTEK TESTING TECHNOLOGY CO., LTD.

Issue	*Name*	*Date*	*Modifications*
A	Jérôme Luc	3/1/2021	Initial release

TABLE OF CONTENTS

1 DEVICE UNDER TEST

Device Under Test	
Device Type	COMOSAR DOSIMETRIC E FIELD PROBE
Manufacturer	MVG
Model	SSE2
Serial Number	SN 08/16 EPGO287
Product Condition (new / used)	Used
Frequency Range of Probe	0.15 GHz-6GHz
Resistance of Three Dipoles at Connector	Dipole 1: R1=0.211 MΩ Dipole 2: R2=0.199 MΩ Dipole 3: R3=0.199 MΩ

2 PRODUCT DESCRIPTION

2.1 GENERAL INFORMATION

MVG's COMOSAR E field Probes are built in accordance to the IEEE 1528, FCC KDB865664 D01, CENELEC EN62209 and CEI/IEC 62209 standards.

Figure 1 – *MVG COMOSAR Dosimetric E field Dipole*

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 IEEE 1528, FCC KDB865664 D01, CENELEC EN62209 and CEI/IEC 62209 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.

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:

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

where

$SAR_{uncertainty}$	is the uncertainty in percent of the probe boundary effect
d_{be}	is the distance between the surface and the closest *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%).

4 MEASUREMENT UNCERTAINTY

The guidelines outlined in the IEEE 1528, OET 65 Bulletin C, CENELEC EN50361 and CEI/IEC 62209 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 %

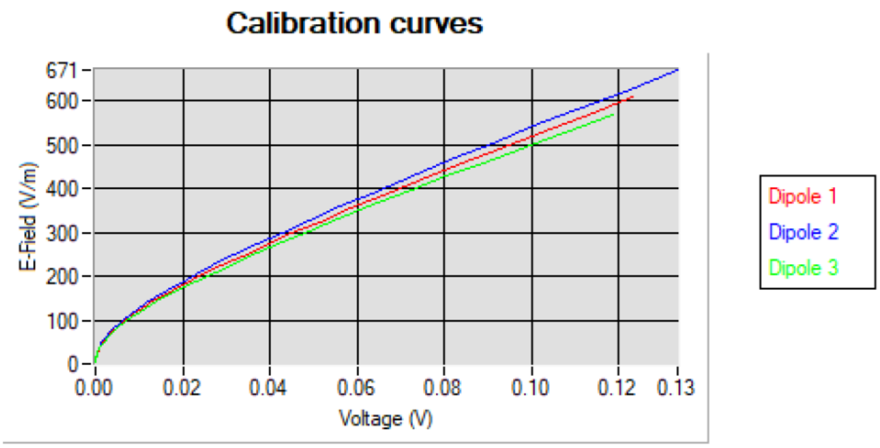
5.1 SENSITIVITY IN AIR

Normx dipole 1 ($\mu V/(V/m)^2$)	Normy dipole 2 ($\mu V/(V/m)^2$)	Normz dipole 3 ($\mu V/(V/m)^2$)
0.72	0.66	0.77

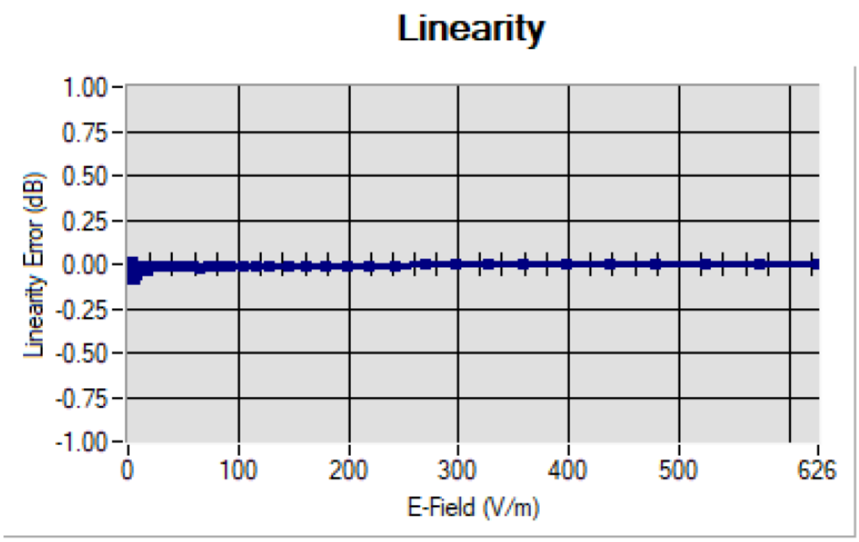
DCP dipole 1 (mV)	DCP dipole 2 (mV)	DCP dipole 3 (mV)
107	110	110

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

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



5.2 LINEARITY



Linearity:+/-1.90% (+/-0.08dB)

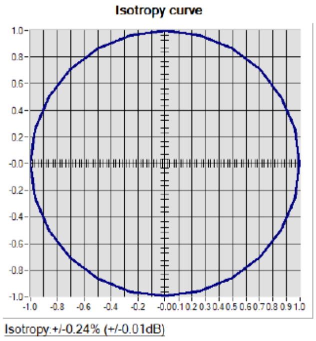
5.3 SENSITIVITY IN LIQUID

Liquid	Frequency (MHz +/- 100MHz)	ConvF
HL750	750	1.49
HL850	835	1.50
HL900	900	1.61
HL1800	1800	1.73
HL1900	1900	1.91
HL2000	2000	1.97
HL2300	2300	1.92
HL2450	2450	1.98
HL2600	2600	1.87
HL3300	3300	1.79
HL3500	3500	1.85
HL3700	3700	1.79
HL3900	3900	2.07
HL4200	4200	2.21
HL4600	4600	2.25
HL4900	4900	2.05
HL5200	5200	1.80
HL5400	5400	2.05
HL5600	5600	2.16
HL5800	5800	2.07

LOWER DETECTION LIMIT: 8mW/kg

5.4 ISOTROPY

HL1800 MHz



6 LIST OF EQUIPMENT

Equipment Summary Sheet				
Equipment Description	**Manufacturer / Model**	**Identification No.**	**Current Calibration Date**	**Next Calibration Date**
Flat Phantom	MVG	SN-20/09-SAM71	Validated. No cal required.	Validated. No cal required.
COMOSAR Test Bench	Version 3	NA	Validated. No cal required.	Validated. No cal required.
Network Analyzer	Rohde & Schwarz ZVM	100203	05/2019	05/2022
Network Analyzer – Calibration kit	Rohde & Schwarz ZV-Z235	101223	05/2019	05/2022
Multimeter	Keithley 2000	1160271	02/2020	02/2023
Signal Generator	Rohde & Schwarz SMB	106589	04/2019	04/2022
Amplifier	Aethercomm	SN 046	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Power Meter	NI-USB 5680	170100013	05/2019	05/2022
Directional Coupler	Narda 4216-20	01386	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Waveguide	Mega Industries	069Y7-158-13-712	Validated. No cal required.	Validated. No cal required.
Waveguide Transition	Mega Industries	069Y7-158-13-701	Validated. No cal required.	Validated. No cal required.
Waveguide Termination	Mega Industries	069Y7-158-13-701	Validated. No cal required.	Validated. No cal required.
Temperature / Humidity Sensor	Testo 184 H1	44220687	05/2020	05/2023