GSM 850											
RF Exposure Conditions	Dist. (mm)	Mode	Test Position	CH.	Freq. (MHz)	Output Power (dBm)	Turn up (dBm)	Turn-up Scaling Factor	SAR10g (W/kg)		Plot No.
									Meas.	Scaled	
Front-of-face	10	GSM	Front	128	824.2	32.60	33.0	1.096	0.213	0.234	
Limb-worn	0	GSM	Back	128	824.2	32.60	33.0	1.096	0.644	**0.706**	1

GSM 1900											
RF Exposure Conditions	Dist. (mm)	Mode	Test Position	CH.	Freq. (MHz)	Output Power (dBm)	Turn up (dBm)	Turn-up Scaling Factor	SAR10g (W/kg)		Plot No.
									Meas.	Scaled	
Front-of-face	10	GSM	Front	512	1850.2	29.14	29.5	1.086	0.413	0.449	
Limb-worn	0	GSM	Back	512	1850.2	29.14	29.5	1.086	1.074	**1.167**	2

WCDMA Band II											
RF Exposure Conditions	Dist. (mm)	Mode	Test Position	CH.	Freq. (MHz)	Output Power (dBm)	Turn up (dBm)	Turn-up Scaling Factor	SAR10g (W/kg)		Plot No.
									Meas.	Scaled	
Front-of-face	10	RMC	Front	9262	1852.4	21.47	22.0	1.130	0.425	0.480	
Limb-worn	0	RMC	Back	9262	1852.4	21.47	22.0	1.130	1.148	**1.297**	3

WCDMA Band V											
RF Exposure Conditions	Dist. (mm)	Mode	Test Position	CH.	Freq. (MHz)	Output Power (dBm)	Turn up (dBm)	Turn-up Scaling Factor	SAR10g (W/kg)		Plot No.
									Meas.	Scaled	
Front-of-face	10	RMC	Front	4233	846.6	21.61	22.0	1.094	0.287	0.314	
Limb-worn	0	RMC	Back	4233	846.6	21.61	22.0	1.094	0.758	**0.829**	4

FDD-LTE Band 2 (20MHz Bandwidth)											
RF Exposure Conditions	Dist. (mm)	Mode	Test Position	CH.	Freq. (MHz)	Output Power (dBm)	Turn up (dBm)	Turn-up Scaling Factor	SAR10g (W/kg)		Plot No.
									Meas.	Scaled	
Front-of-face	10	QPSK,1RB	Front	19100	1900	22.94	23.5	1.138	0.247	0.281	
		QPSK,50%RB	Front	19100	1900	22.94	23.5	1.138	0.231	0.263	
Limb-worn	0	QPSK,1RB	Back	19100	1900	22.94	23.5	1.138	0.813	**0.925**	5
		QPSK,50%RB	Back	19100	1900	22.94	23.5	1.138	0.752	0.855	

FDD-LTE Band 4 (20MHz Bandwidth)											
RF Exposure Conditions	Dist. (mm)	Mode	Test Position	CH.	Freq. (MHz)	Output Power (dBm)	Turn up (dBm)	Turn-up Scaling Factor	SAR10g (W/kg)		Plot No.
									Meas.	Scaled	
Front-of-face	10	QPSK,1RB	Front	20175	1732.5	22.72	23.0	1.067	0.310	0.331	
		QPSK,50%RB	Front	20175	1732.5	22.72	23.0	1.067	0.307	0.327	
Limb-worn	0	QPSK,1RB	Back	20175	1732.5	22.72	23.0	1.067	0.977	**1.042**	6
		QPSK,50%RB	Back	20175	1732.5	22.72	23.0	1.067	0.943	1.006	

FDD-LTE Band 5 (10MHz Bandwidth)											
RF Exposure Conditions	Dist. (mm)	Mode	Test Position	CH.	Freq. (MHz)	Output Power (dBm)	Turn up (dBm)	Turn-up Scaling Factor	SAR10g (W/kg)		Plot No.
									Meas.	Scaled	
Front-of-face	10	QPSK,1RB	Front	20525	836.5	22.40	23.0	1.148	0.290	0.333	
		QPSK,50%RB	Front	20525	836.5	22.40	23.0	1.148	0.297	0.341	
Limb-worn	0	QPSK,1RB	Back	20525	836.5	22.40	23.0	1.148	0.649	**0.745**	7
		QPSK,50%RB	Back	20525	836.5	22.40	23.0	1.148	0.583	0.669	

FDD-LTE Band 7 (20MHz Bandwidth)											
RF Exposure Conditions	Dist. (mm)	Mode	Test Position	CH.	Freq. (MHz)	Output Power (dBm)	Turn up (dBm)	Turn-up Scaling Factor	SAR10g (W/kg)		Plot No.
									Meas.	Scaled	
Front-of-face	10	QPSK,1RB	Front	21350	2560	23.08	23.5	1.102	0.235	0.259	
		QPSK,50%RB	Front	21350	2560	23.08	23.5	1.102	0.246	0.271	
Limb-worn	0	QPSK,1RB	Back	21350	2560	23.08	23.5	1.102	0.511	0.563	
		QPSK,50%RB	Back	21350	2560	23.08	23.5	1.102	0.574	**0.632**	8

FDD-LTE Band 12 (10MHz Bandwidth)											
RF Exposure Conditions	Dist. (mm)	Mode	Test Position	CH.	Freq. (MHz)	Output Power (dBm)	Turn up (dBm)	Turn-up Scaling Factor	SAR10g (W/kg)		Plot No.
									Meas.	Scaled	
Front-of-face	10	QPSK,1RB	Front	23130	711	22.33	23.0	1.167	0.075	0.088	
		QPSK,50%RB	Front	23130	711	22.33	23.0	1.167	0.071	0.083	
Limb-worn	0	QPSK,1RB	Back	23130	711	22.33	23.0	1.167	0.489	**0.571**	9
		QPSK,50%RB	Back	23130	711	22.33	23.0	1.167	0.468	0.546	

FDD-LTE Band 17 (10MHz Bandwidth)											
RF Exposure Conditions	Dist. (mm)	Mode	Test Position	CH.	Freq. (MHz)	Output Power (dBm)	Turn up (dBm)	Turn-up Scaling Factor	SAR10g (W/kg)		Plot No.
									Meas.	Scaled	
Front-of-face	10	QPSK,1RB	Front	23800	711	22.27	23.0	1.183	0.065	0.077	
		QPSK,50%RB	Front	23800	711	22.27	23.0	1.183	0.074	0.088	
Limb-worn	0	QPSK,1RB	Back	23800	711	22.27	23.0	1.183	0.624	0.738	
		QPSK,50%RB	Back	23800	711	22.27	23.0	1.183	0.637	**0.754**	10

TDD-LTE Band 38 (20MHz Bandwidth)											
RF Exposure Conditions	Dist. (mm)	Mode	Test Position	CH.	Freq. (MHz)	Output Power (dBm)	Turn up (dBm)	Turn-up Scaling Factor	SAR10g (W/kg)		Plot No.
									Meas.	Scaled	
Front-of-face	10	QPSK,1RB	Front	38000	2595	22.79	23.5	1.178	0.284	0.334	
		QPSK,50%RB	Front	38000	2595	22.79	23.5	1.178	0.247	0.291	
Limb-worn	0	QPSK,1RB	Back	38000	2595	22.79	23.5	1.178	0.998	**1.175**	11
		QPSK,50%RB	Back	38000	2595	22.79	23.5	1.178	0.891	1.049	

TDD-LTE Band 41 (20MHz Bandwidth)											
RF Exposure Conditions	Dist. (mm)	Mode	Test Position	CH.	Freq. (MHz)	Output Power (dBm)	Turn up (dBm)	Turn-up Scaling Factor	SAR10g (W/kg)		Plot No.
									Meas.	Scaled	
Front-of-face	10	QPSK,1RB	Front	40620	2593	22.83	23.5	1.167	0.320	0.373	
		QPSK,50%RB	Front	40620	2593	22.83	23.5	1.167	0.363	0.424	
Limb-worn	0	QPSK,1RB	Back	40620	2593	22.83	23.5	1.167	0.998	**1.164**	12
		QPSK,50%RB	Back	40620	2593	22.83	23.5	1.167	0.891	1.040	

WLAN 2.4G											
RF Exposure Conditions	Dist. (mm)	Mode	Test Position	CH.	Freq. (MHz)	Output Power (dBm)	Turn up (dBm)	Turn-up Scaling Factor	SAR10g (W/kg)		Plot No.
									Meas.	Scaled	
Front-of-face	10	802.11b	Front	6	2437	12.86	13.5	1.159	0.086	0.100	
Limb-worn	0	802.11b	Back	6	2437	12.86	13.5	1.159	0.156	**0.181**	13

Remark:
1. The value with the bold is the maximum SAR Value of each test band.
2. Per FCC KDB Publication 447498 D01, if the reported (scaled) SAR measured at the middle channel or highest output power channel for each test configuration is ≤ 0.8 W/kg then testing at the other channels SAR tests are not necessary.

14.4 SAR Measurement Variability

According to KDB865664, Repeated measurements are required only when the measured SAR is ≥ 0.80 W/kg. If the measured SAR value of the initial repeated measurement is < 1.45 W/kg with ≤ 20% variation, only one repeated measurement is required to reaffirm that the results are not expected to have substantial variations, which may introduce significant compliance concerns. A second repeated measurement is required only if the measured result for the initial repeated measurement is within 10% of the SAR limit and vary by more than 20%, which are often related to device and measurement setup difficulties. The following procedures are applied to determine if repeated measurements are required. The same procedures should be adapted for measurements according to extremity and occupational exposure limits by applying a factor of 2.5 for extremity exposure and a factor of 5 for occupational exposure to the corresponding SAR thresholds.19 The repeated measurement results must be clearly identified in the SAR report. All measured SAR, including the repeated results, must be considered to determine compliance and for reporting according to KDB 690783.Repeated measurement is not required when the original highest measured SAR is < 0.80 W/kg; steps 2) through 4) do not apply.

1) When the original highest measured SAR is ≥ 0.80 W/kg, repeat that measurement once.
2) Perform a second repeated measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is > 1.20 or when the original or repeated measurement is ≥ 1.45 W/kg (~ 10% from the 1-g SAR limit).
3) Perform a third repeated measurement only if the original, first or second repeated measurement is ≥ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.
4) Perform a third repeated measurement only if the original, first or second repeated measurement is ≥ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20

Test Mode	Frequency Band (MHz)	RF Exposure Configuration	Test Position	Repeated SAR (yes/no)	Highest Measured SAR1-g (W/Kg)	First Repeated	
						Measured SAR1-g (W/Kg)	Largest to Smallest SAR Ratio
GSM 1900	1850.2	Limb-worn	Back	yes	1.074	1.041	1.032
WCDMA Band II	1852.4	Limb-worn	Back	yes	1.148	1.107	1.037
FDD-LTE Band 2	1900	Limb-worn	Back	yes	0.813	0.794	1.024
FDD-LTE Band 4	1732.5	Limb-worn	Back	yes	0.977	0.957	1.021
TDD-LTE Band 38	2595	Limb-worn	Back	yes	0.998	0.975	1.024
TDD-LTE Band 41	2593	Limb-worn	Back	yes	0.998	0.971	1.028

14.5 Simultaneous Transmission Evaluation

Simultaneous transmission SAR test exclusion is determined for each operating configuration and exposure condition according to the reported standalone SAR of each applicable simultaneous transmiting antenna.

Application Simultaneous Transmission information:

No.	Configurations	Front-of-face	Limb-worn
1	WWAN+WLAN 2.4G	Yes	Yes
2	WWAN+ Bluetooth	Yes	Yes
3	WLAN+ Bluetooth	No	No

Remark:
1. WWAN cannot transmit simultaneously.
2. WLAN and Bluetooth share the same antenna, and cannot transmit simultaneously.
3. According to the KDB 447498 D01 v06, when standalone SAR test exclusion applies to an antenna that transmits simultaneously with other antennas, the standalone SAR must be estimated according to following to determine simultaneous transmission SAR test exclusion:
● (max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)]·[√f(GHz)/x] W/kg for test separation distances ≤ 50 mm;
where x = 7.5 for 1-g SAR, and x = 18.75 for 10-g SAR.
● 0.4 W/kg for 1-g SAR and 1.0 W/kg for 10-g SAR, when the test separation distances is > 50 mm

Estimated stand alone SAR						
Communication system	Frequency (MHz)	Maximum Power (dBm)	Maximum Power (mW)	Separation Distance (mm)	X	Estimated SAR1-g (W/kg)
Bluetooth*	2480	3.0	2.00	5	7.5	0.084
Bluetooth*	2480	3.0	2.00	10	7.5	0.042

Note:
1. Bluetooth*- Including Lower power Bluetooth
2. Maximum average power including tune-up tolerance;
3. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion

4. Per FCC KD B447498 D01, simultaneous transmission SAR test exclusion may be applied when the sum of the 1-g SAR for all the transmitting antenna in a specific a physical test configuration is ≤1.6 W/Kg. When the sum is greater than the SAR limit, SAR test exclusion is determined by the SAR to peak location separation ratio.

$$\text{Ratio}=\frac{(SAR_1+SAR_2)^{1.5}}{(\text{peak location separation,mm})}<0.04$$

5. Simultaneous transmission of maximum SAR sum calculation.

RF Exposure Conditions	Test Position	WWAN	WLAN 2.4G	Summed SAR (W/kg)	SAR1-g Limit (W/kg)
		Scaled SAR (W/kg)	Scaled SAR (W/kg)		
Front-of-face	Front	0.480	0.100	0.580	1.6
Limb-worn	Back	1.297	0.181	1.478	4.0

15. Test Plots

15.1 System Performance Check

System check at 750 MHz

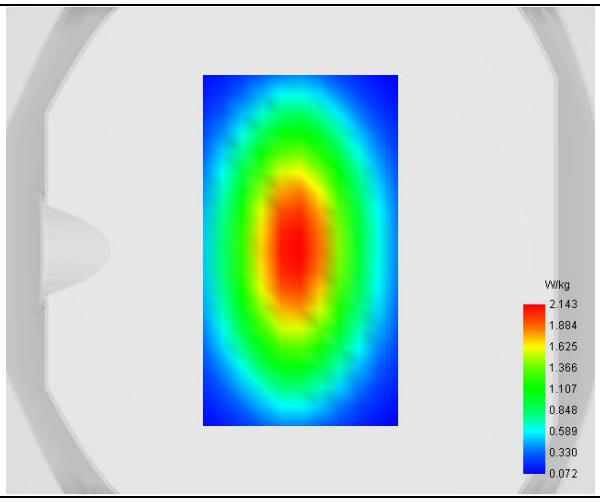
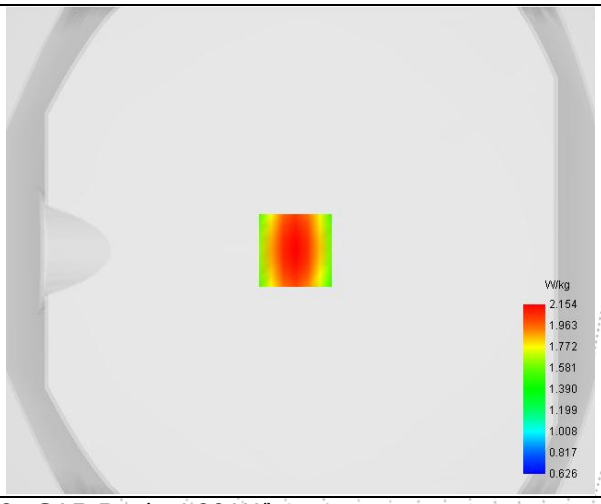
A. Experimental conditions.

Probe	SN 26/23 EPGO420
ConvF	0.80
Area Scan	surf_sam_plan.txt
Zoom Scan	7x7x8,dx=5mm dy=5mm dz=4mm
Phantom	Validation plane
Device Position	Dipole
Band	CW750
Channels	Middle
Signal	CW (Crest factor: 1.0)

B. Permitivity

Frequency (MHz)	750.000
Relative permitivity (real part)	42.889
Relative permitivity (imaginary part)	20.984
Conductivity (S/m)	0.878

C. SAR Surface and Volume

SURFACE SAR	VOLUME SAR
	

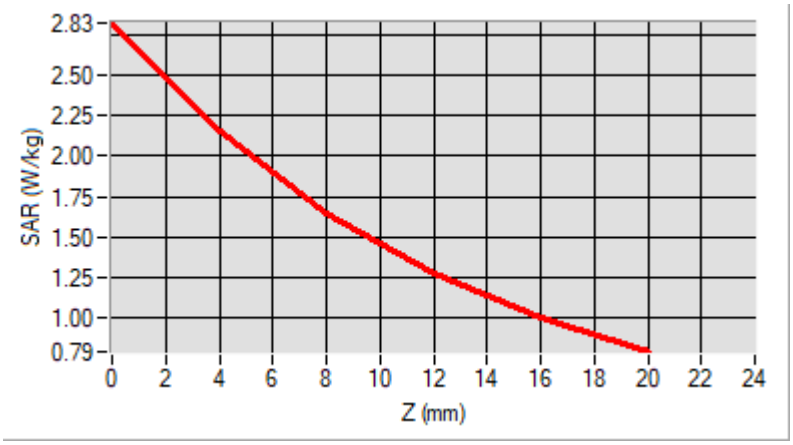
Maximum location: X=-2.00, Y=0.00 ; SAR Peak: 4.96 W/kg

D. SAR 1g & 10g

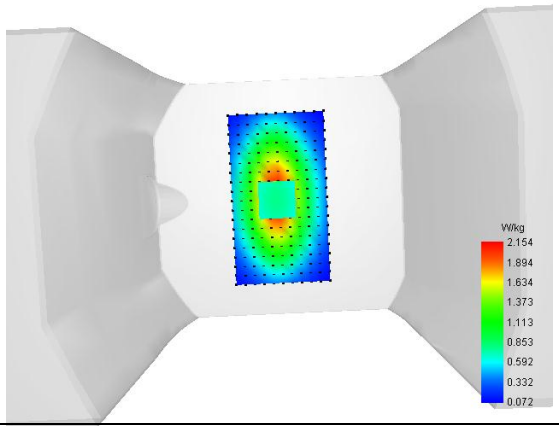
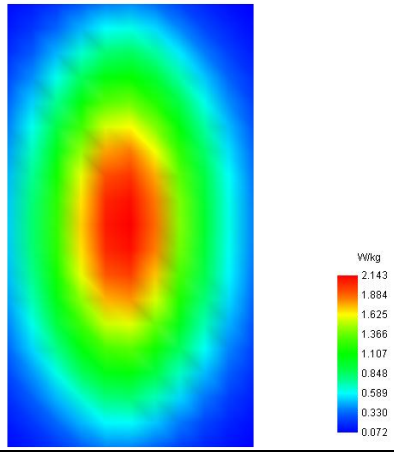
SAR 10g (W/Kg)	0.756
SAR 1g (W/Kg)	2.136
Variation (%)	-3.529
Horizontal validation criteria: minimum distance (mm)	0.000000
Vertical validation criteria: SAR ratio M2/M1 (%)	0.000000

E. Z Axis Scan

Z (mm)	0.00	4.00	8.00	12.00	16.00
SAR (W/Kg)	2.832	2.176	1.674	1.285	1.064



F. 3D Image

3D screen shot	Hot spot position
	

System check at 835 MHz

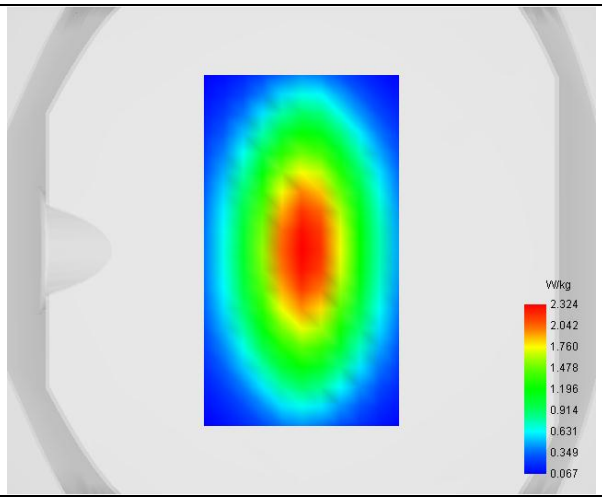
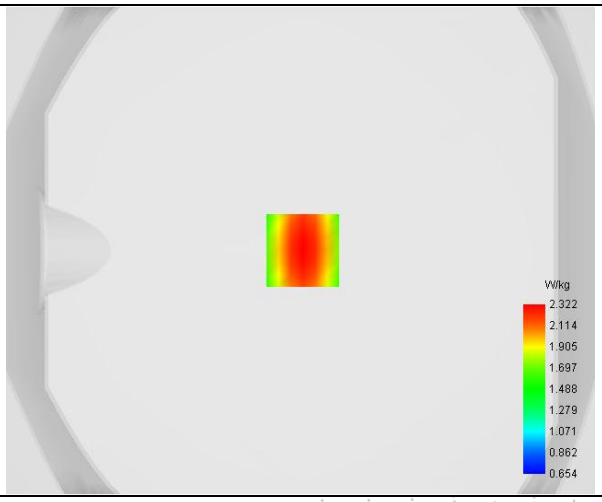
A. Experimental conditions.

Probe	SN 26/23 EPGO420
ConvF	0.81
Area Scan	surf_sam_plan.txt
Zoom Scan	7x7x8,dx=5mm dy=5mm dz=4mm
Phantom	Validation plane
Device Position	Dipole
Band	CW835
Channels	Middle
Signal	CW (Crest factor: 1.0)

B. Permitivity

Frequency (MHz)	835.000
Relative permitivity (real part)	40.312
Relative permitivity (imaginary part)	20.910
Conductivity (S/m)	0.879

C. SAR Surface and Volume

SURFACE SAR	**VOLUME SAR**
	

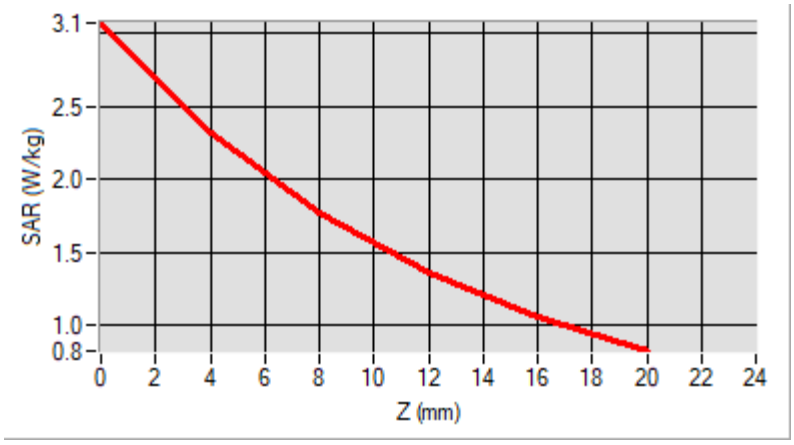
Maximum location: X=1.00, Y=0.00 ; SAR Peak: 5.68 W/kg

D. SAR 1g & 10g

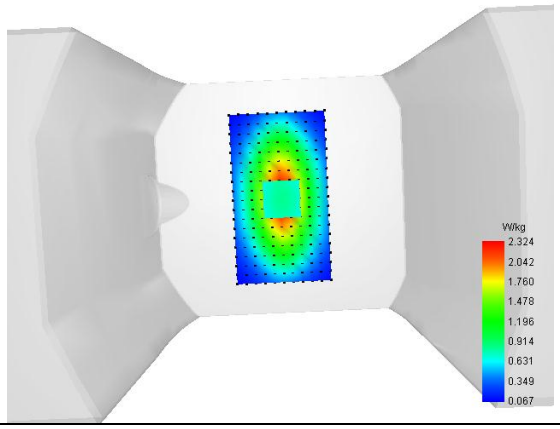
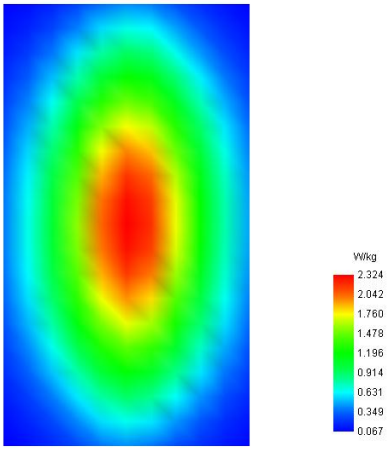
SAR 10g (W/Kg)	1.257
SAR 1g (W/Kg)	2.564
Variation (%)	0.500
Horizontal validation criteria: minimum distance (mm)	0.000000
Vertical validation criteria: SAR ratio M2/M1 (%)	0.000000

E. Z Axis Scan

Z (mm)	0.00	4.00	8.00	12.00	16.00
SAR (W/Kg)	3.108	2.344	1.786	1.395	1.109



F. 3D Image

3D screen shot	Hot spot position
	

System check at 1800 MHz

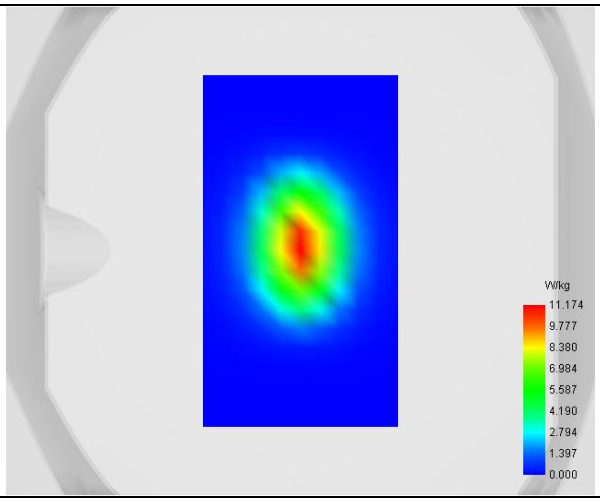
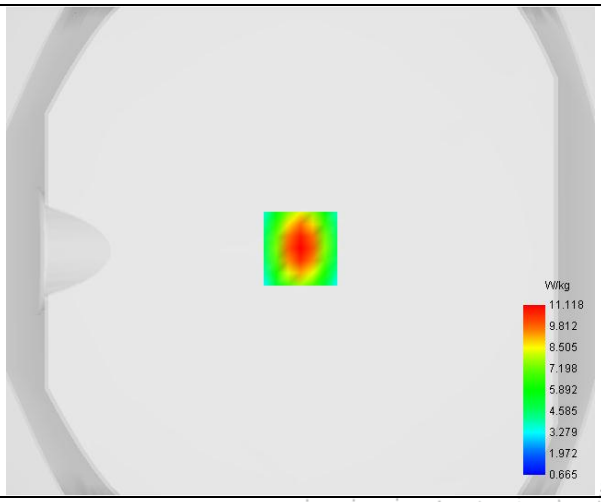
A. Experimental conditions.

Probe	SN 26/23 EPGO420
ConvF	0.96
Area Scan	surf_sam_plan.txt
Zoom Scan	7x7x8,dx=5mm dy=5mm dz=4mm
Phantom	Validation plane
Device Position	Dipole
Band	CW1800
Channels	Middle
Signal	CW (Crest factor: 1.0)

B. Permitivity

Frequency (MHz)	1800.000
Relative permitivity (real part)	39.503
Relative permitivity (imaginary part)	18.082
Conductivity (S/m)	1.366

C. SAR Surface and Volume

SURFACE SAR	VOLUME SAR
	

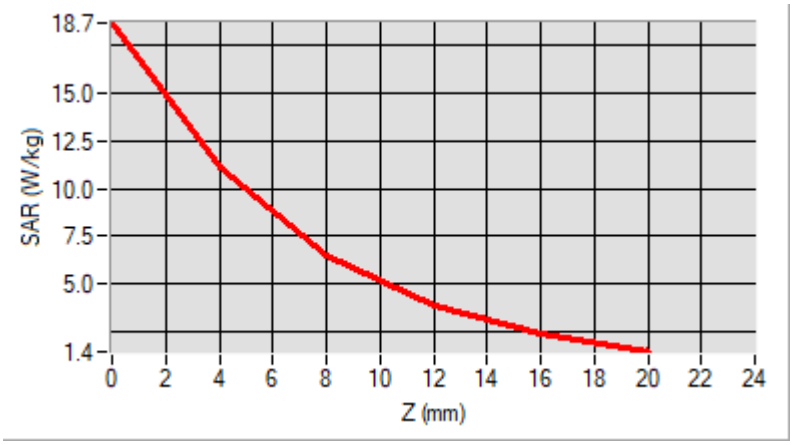
Maximum location: X=0.00, Y=1.00 ; SAR Peak: 22.78 W/kg

D. SAR 1g & 10g

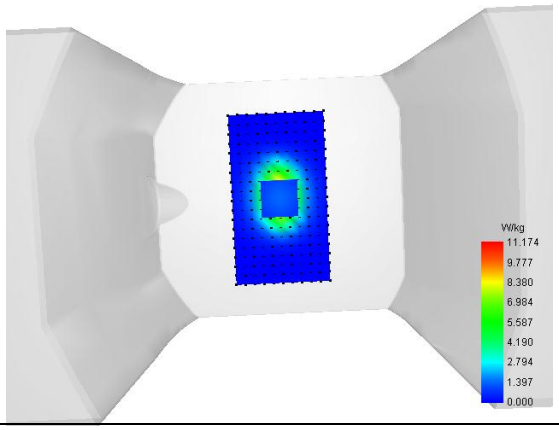
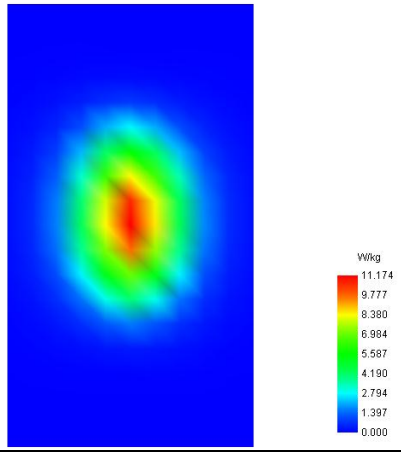
SAR 10g (W/Kg)	4.432
SAR 1g (W/Kg)	9.770
Variation (%)	-1.182
Horizontal validation criteria: minimum distance (mm)	0.000000
Vertical validation criteria: SAR ratio M2/M1 (%)	0.000000

E. Z Axis Scan

Z (mm)	0.00	4.00	8.00	12.00	16.00
SAR (W/Kg)	18.71+	11.234	6.561	3.924	2.453



F. 3D Image

3D screen shot	Hot spot position
	

System check at 1900 MHz

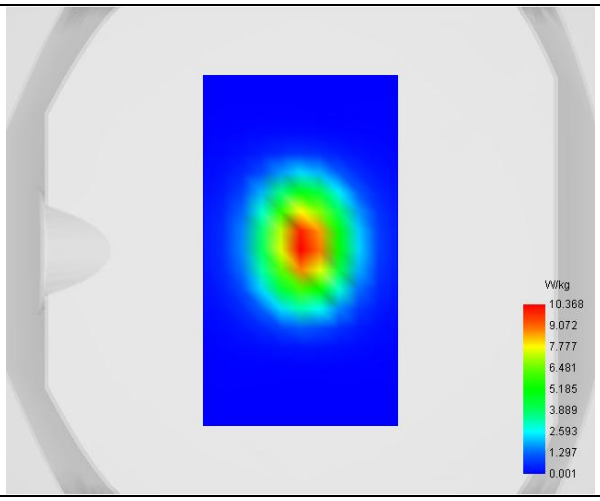
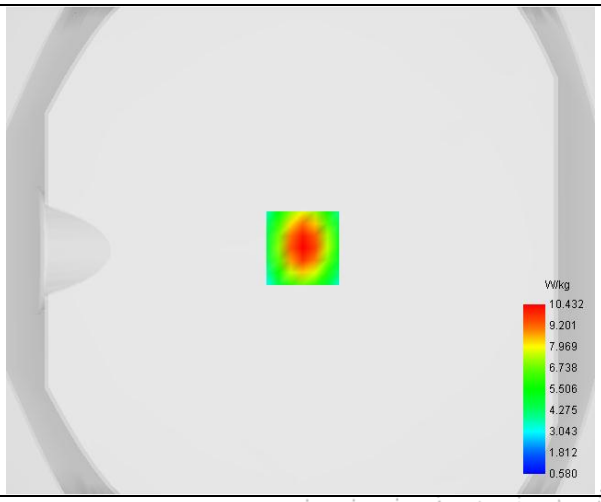
A. Experimental conditions.

Probe	SN 26/23 EPGO420
ConvF	1.04
Area Scan	surf_sam_plan.txt
Zoom Scan	7x7x8,dx=5mm dy=5mm dz=4mm
Phantom	Validation plane
Device Position	Dipole
Band	CW1900
Channels	Middle
Signal	CW (Crest factor: 1.0)

B. Permitivity

Frequency (MHz)	1900.000
Relative permitivity (real part)	40.002
Relative permitivity (imaginary part)	12.866
Conductivity (S/m)	1.387

C. SAR Surface and Volume

SURFACE SAR	VOLUME SAR
	

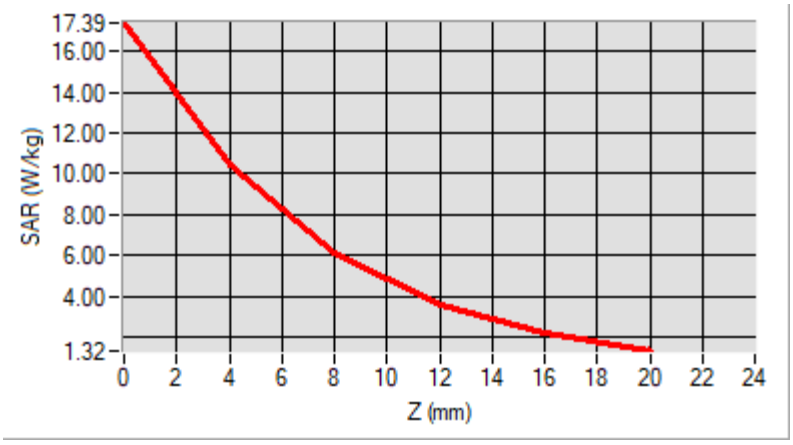
Maximum location: X=1.00, Y=1.00 ; SAR Peak: 22.54 W/kg

D. SAR 1g & 10g

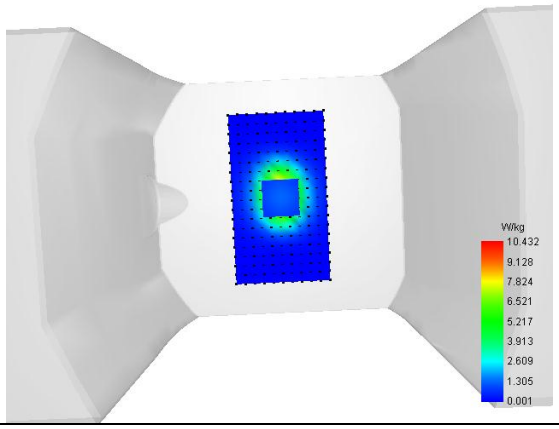
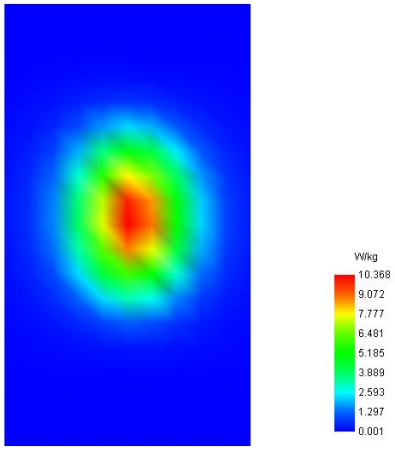
SAR 10g (W/Kg)	0.457
SAR 1g (W/Kg)	10.483
Variation (%)	0.534
Horizontal validation criteria: minimum distance (mm)	0.000000
Vertical validation criteria: SAR ratio M2/M1 (%)	0.000000

E. Z Axis Scan

Z (mm)	0.00	4.00	8.00	12.00	16.00
SAR (W/Kg)	17.387	10.484	6.206	3.672	2.184



F. 3D Image

3D screen shot	Hot spot position
	

System check at 2450 MHz

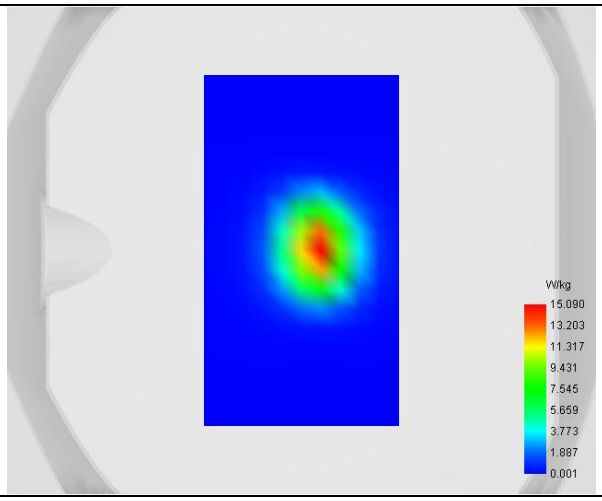
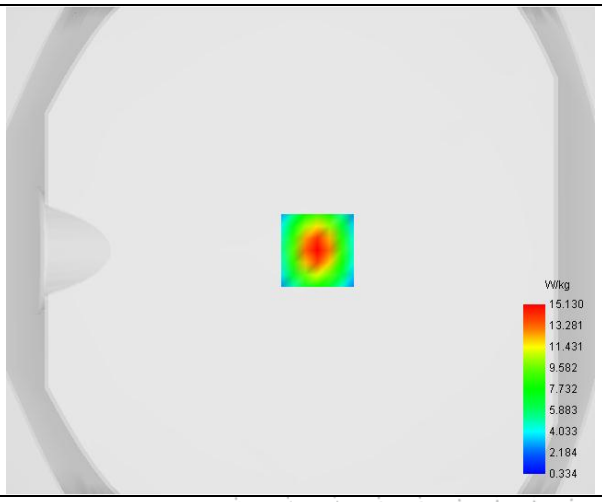
A. Experimental conditions.

Probe	SN 26/23 EPGO420
ConvF	1.11
Area Scan	surf_sam_plan.txt
Zoom Scan	7x7x8,dx=5mm dy=5mm dz=4mm
Phantom	Validation plane
Device Position	Dipole
Band	CW2450
Channels	Middle
Signal	CW (Crest factor: 1.0)

B. Permitivity

Frequency (MHz)	2450.000
Relative permitivity (real part)	39.679
Relative permitivity (imaginary part)	13.242
Conductivity (S/m)	1.749

C. SAR Surface and Volume

SURFACE SAR	VOLUME SAR
	

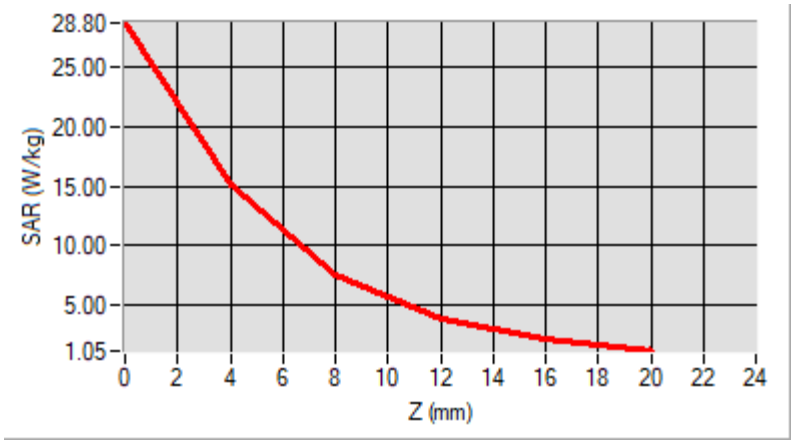
Maximum location: X=7.00, Y=0.00 ; SAR Peak: 29.42 W/kg

D. SAR 1g & 10g

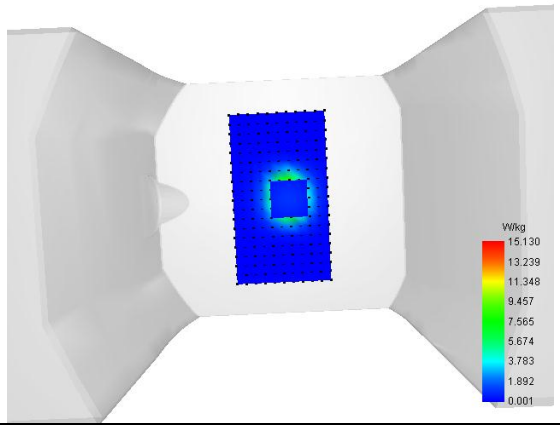
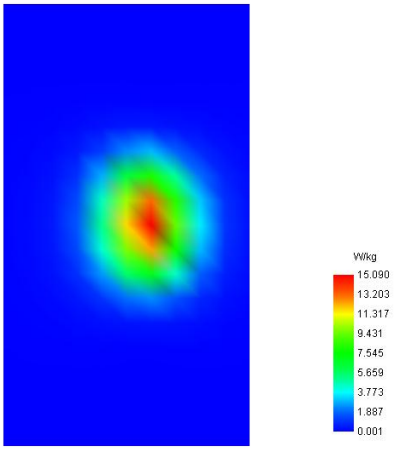
SAR 10g (W/Kg)	6.754
SAR 1g (W/Kg)	14.227
Variation (%)	-1.123
Horizontal validation criteria: minimum distance (mm)	0.000000
Vertical validation criteria: SAR ratio M2/M1 (%)	0.000000

E. Z Axis Scan

Z (mm)	0.00	4.00	8.00	12.00	16.00
SAR (W/Kg)	28.802	15.018	7.416	3.658	1.912



F. 3D Image

3D screen shot	Hot spot position
	

System check at 2600 MHz

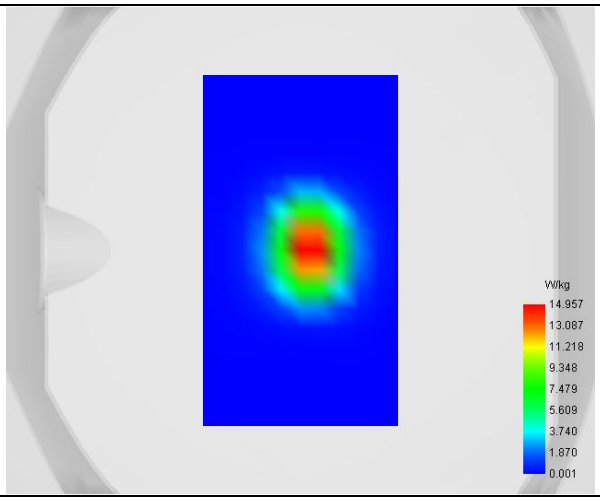
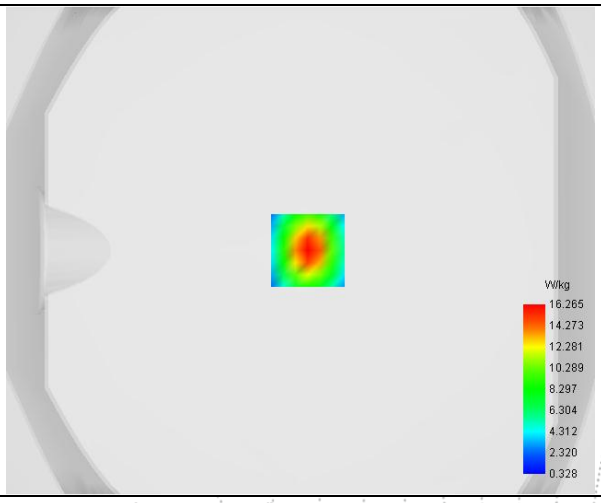
A. Experimental conditions.

Probe	SN 26/23 EPGO420
ConvF	1.03
Area Scan	surf_sam_plan.txt
Zoom Scan	7x7x8,dx=5mm dy=5mm dz=4mm
Phantom	Validation plane
Device Position	Dipole
Band	CW2600
Channels	Middle
Signal	CW (Crest factor: 1.0)

B. Permitivity

Frequency (MHz)	2600.000
Relative permitivity (real part)	39.045
Relative permitivity (imaginary part)	13.906
Conductivity (S/m)	1.929

C. SAR Surface and Volume

SURFACE SAR	VOLUME SAR
	

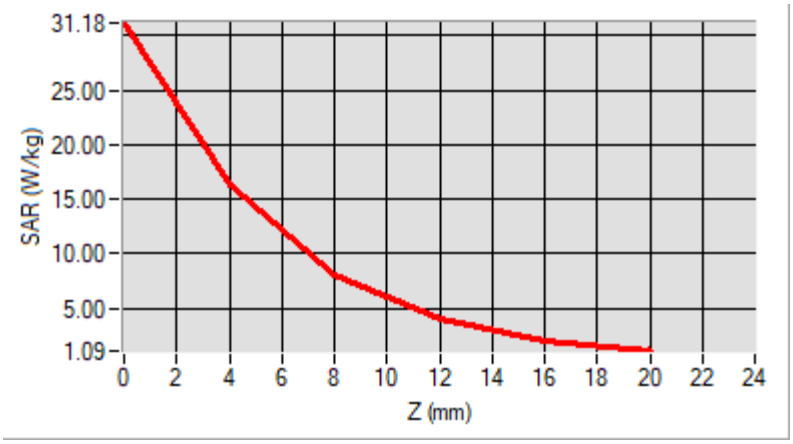
Maximum location: X=3.00, Y=0.00 ; SAR Peak: 31.98 W/kg

D. SAR 1g & 10g

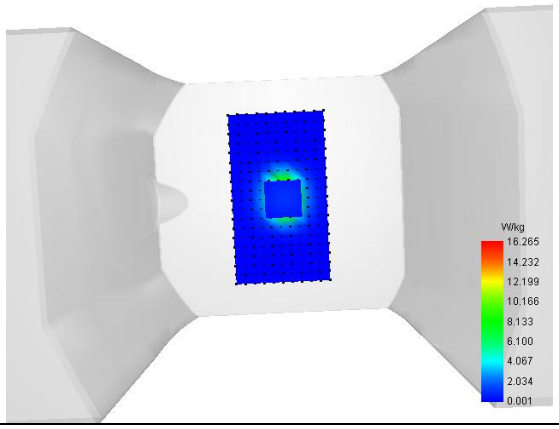
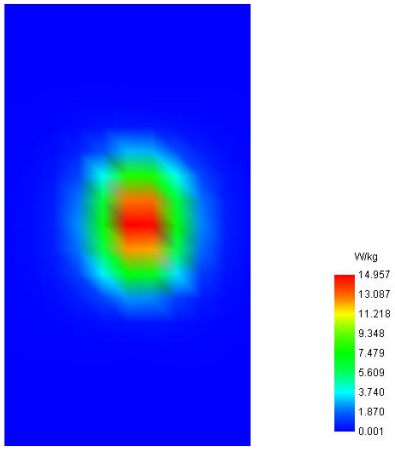
SAR 10g (W/Kg)	6.174
SAR 1g (W/Kg)	13.651
Variation (%)	-2.637
Horizontal validation criteria: minimum distance (mm)	0.000000
Vertical validation criteria: SAR ratio M2/M1 (%)	0.000000

E. Z Axis Scan

Z (mm)	0.00	4.00	8.00	12.00	16.00
SAR (W/Kg)	31.172	16.108	7.982	3.835	1.964



F. 3D Image

3D screen shot	Hot spot position
	

15.2 SAR Test Graph Results

SAR plots for the highest measured SAR in each exposure configuration, wireless mode and frequency band combination according to FCC KDB 865664 D02

Plot 1

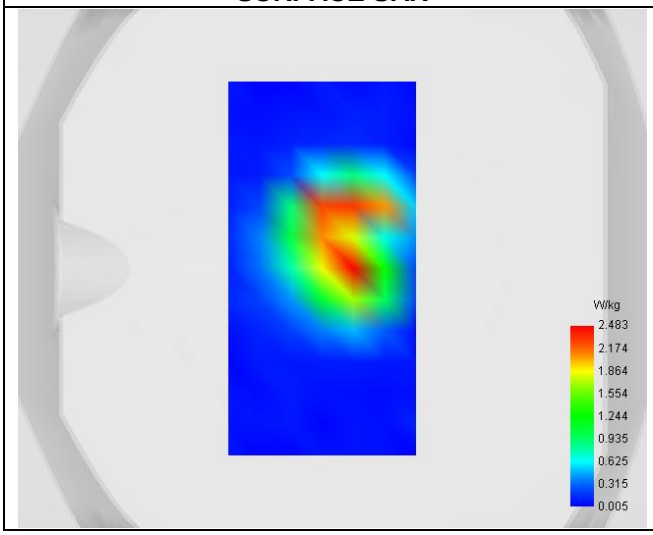
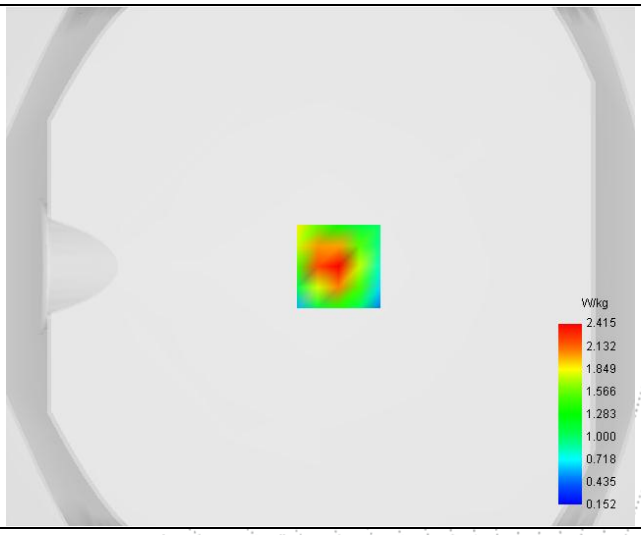
A. Experimental conditions.

Probe	SN 26/23 EPGO420
ConvF	0.81
Area Scan	surf_sam_plan.txt
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Phantom	Validation plane
Device Position	Body
Band	GSM850
Channels	Lower (128)
Signal	TDMA (Crest factor: 8.0)

B. Permitivity

Frequency (MHz)	824.200
Relative permitivity (real part)	40.312
Relative permitivity (imaginary part)	19.649
Conductivity (S/m)	0.879

C. SAR Surface and Volume

SURFACE SAR	VOLUME SAR
	

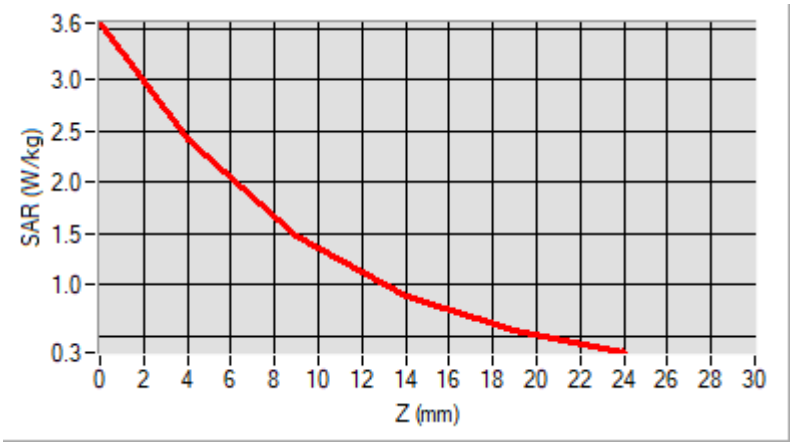
Maximum location: X=7.00, Y=0.00 ; SAR Peak: 3.61 W/kg

D. SAR 1g & 10g

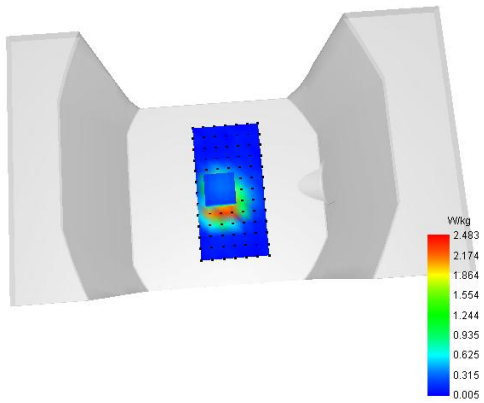
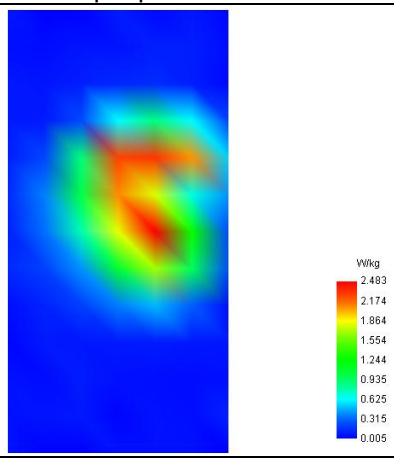
SAR 10g (W/Kg)	0.475
SAR 1g (W/Kg)	0.644
Variation (%)	0.040
Horizontal validation criteria: minimum distance (mm)	0.000000
Vertical validation criteria: SAR ratio M2/M1 (%)	0.000000

E. Z Axis Scan

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	3.552	2.415	1.467	0.895	0.560



F. 3D Image

3D screen shot	Hot spot position
	

Plot 2

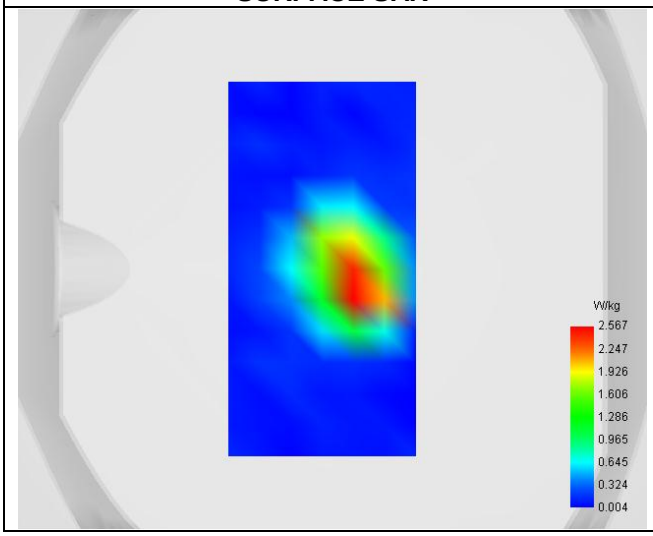
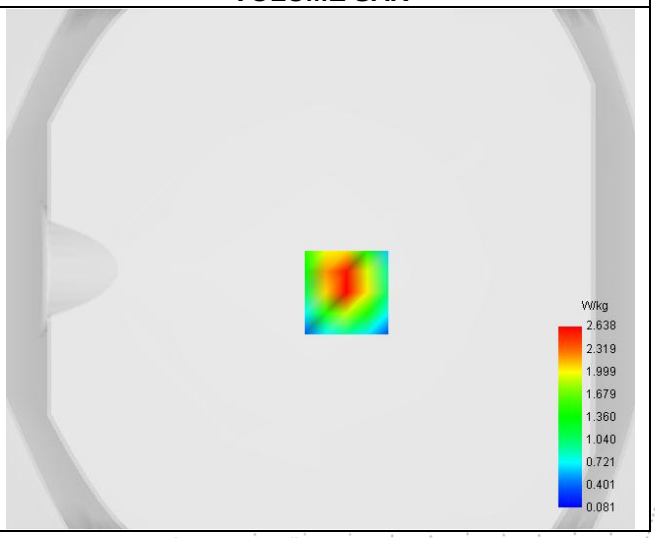
A. Experimental conditions.

Probe	SN 26/23 EPGO420
ConvF	1.04
Area Scan	surf_sam_plan.txt
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Phantom	Validation plane
Device Position	Body
Band	GSM1900
Channels	Lower (512)
Signal	TDMA (Crest factor: 8.0)

B. Permitivity

Frequency (MHz)	1850.200
Relative permitivity (real part)	40.002
Relative permitivity (imaginary part)	13.629
Conductivity (S/m)	1.387

C. SAR Surface and Volume

SURFACE SAR	VOLUME SAR
	

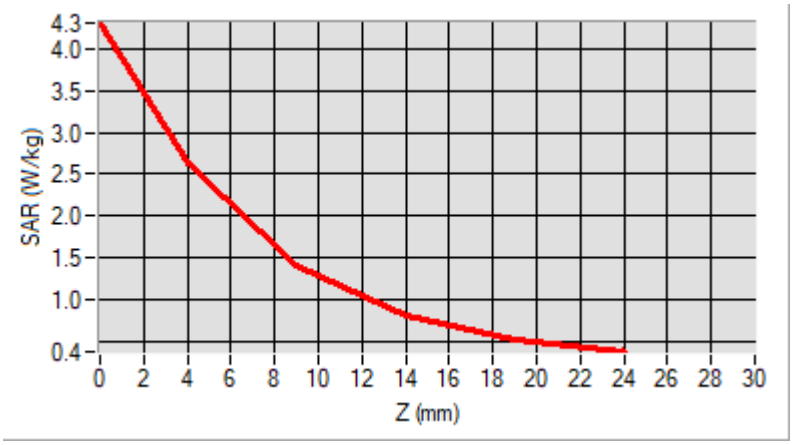
Maximum location: X=10.00, Y=-9.00 ; SAR Peak: 4.43 W/kg

D. SAR 1g & 10g

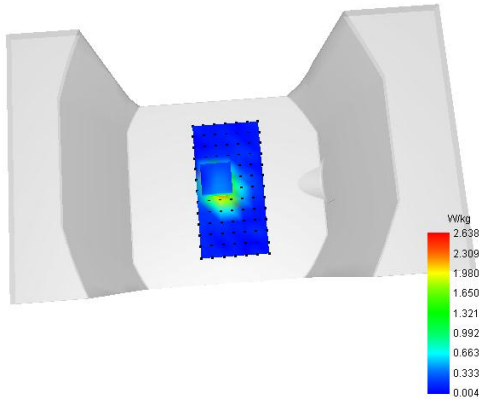
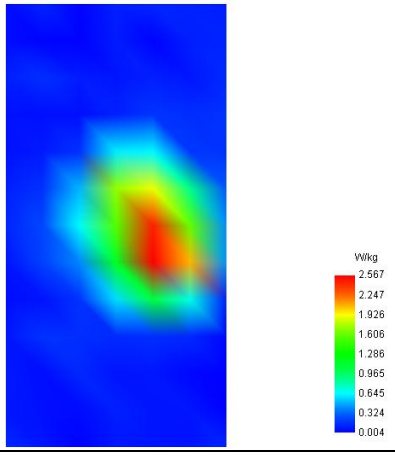
SAR 10g (W/Kg)	0.547
SAR 1g (W/Kg)	1.074
Variation (%)	0.300
Horizontal validation criteria: minimum distance (mm)	0.000000
Vertical validation criteria: SAR ratio M2/M1 (%)	0.000000

E. Z Axis Scan

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	4.311	2.638	1.406	0.795	0.519



F. 3D Image

3D screen shot	Hot spot position
	

Plot 3

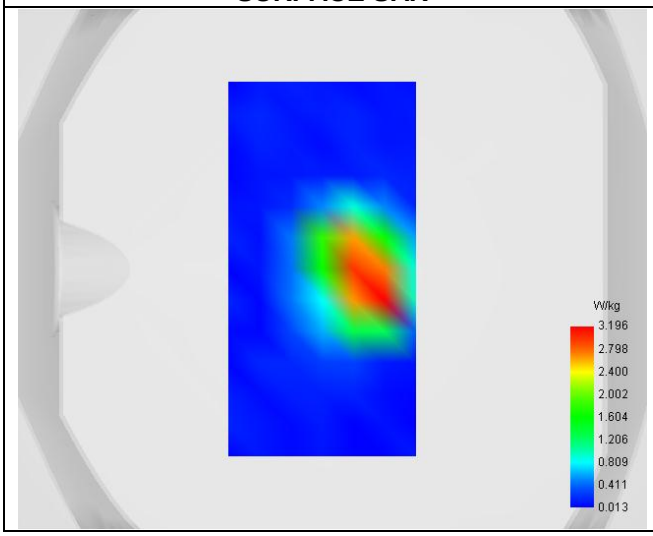
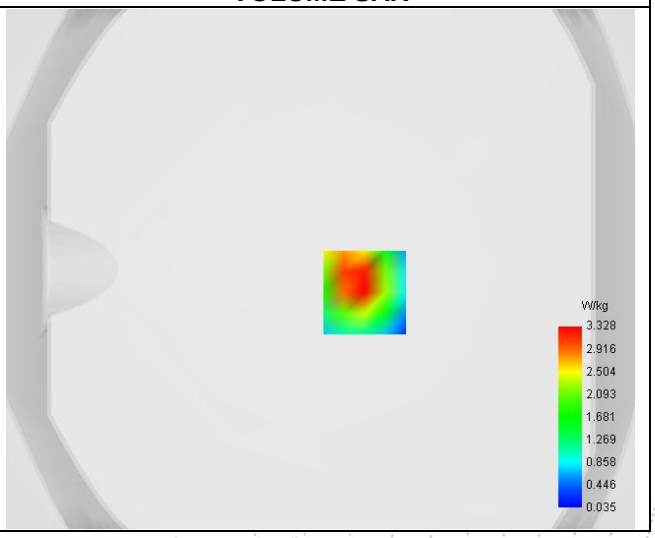
A. Experimental conditions.

Probe	SN 26/23 EPGO420
ConvF	1.04
Area Scan	surf_sam_plan.txt
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Phantom	Validation plane
Device Position	Body
Band	Band2_WCDMA1900
Channels	Lower (9262)
Signal	WCDMA (Crest factor: 1.0)

B. Permitivity

Frequency (MHz)	1852.400
Relative permitivity (real part)	40.002
Relative permitivity (imaginary part)	13.612
Conductivity (S/m)	1.387

C. SAR Surface and Volume

SURFACE SAR	VOLUME SAR
	

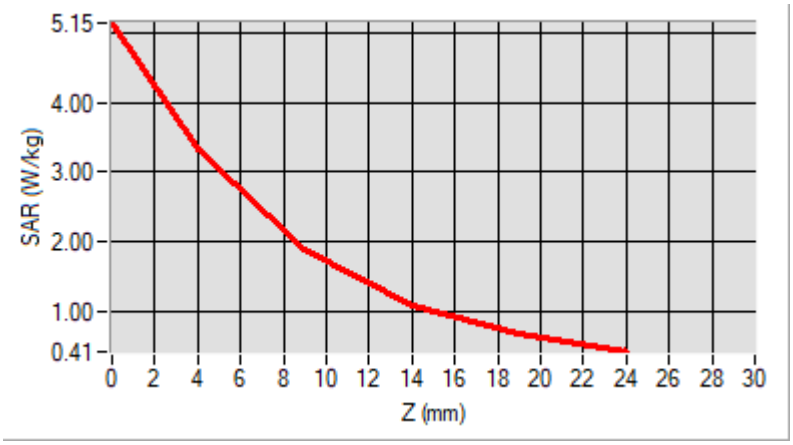
Maximum location: X=17.00, Y=-9.00 ; SAR Peak: 5.45 W/kg

D. SAR 1g & 10g

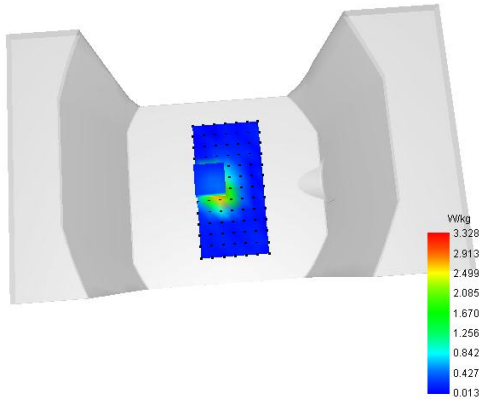
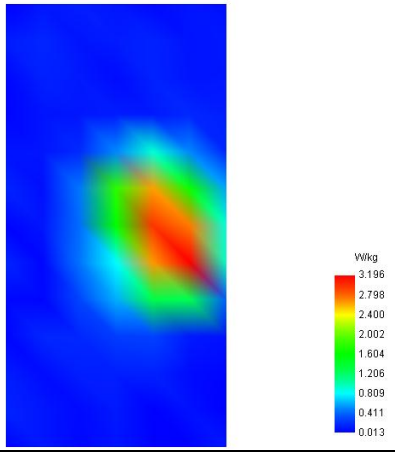
SAR 10g (W/Kg)	0.727
SAR 1g (W/Kg)	1.148
Variation (%)	-4.040
Horizontal validation criteria: minimum distance (mm)	0.000000
Vertical validation criteria: SAR ratio M2/M1 (%)	0.000000

E. Z Axis Scan

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	5.154	3.328	1.889	1.092	0.669



F. 3D Image

3D screen shot	Hot spot position
	

Plot 4

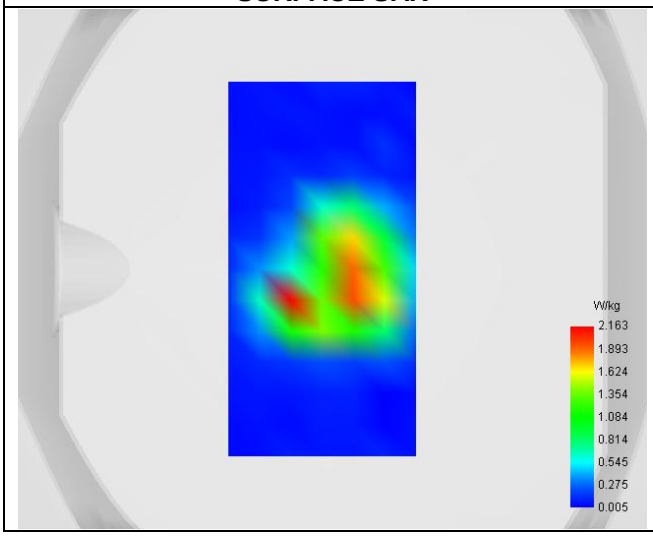
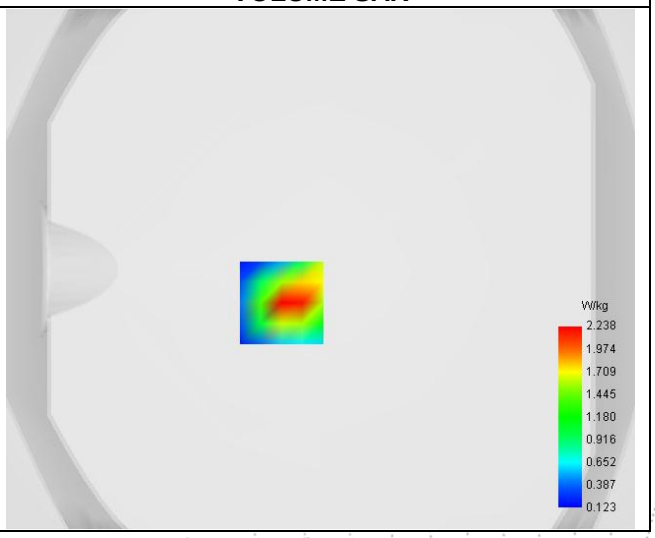
A. Experimental conditions.

Probe	SN 26/23 EPGO420
ConvF	0.81
Area Scan	surf_sam_plan.txt
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Phantom	Validation plane
Device Position	Body
Band	Band5_WCDMA850
Channels	Higher (4233)
Signal	WCDMA (Crest factor: 1.0)

B. Permitivity

Frequency (MHz)	846.600
Relative permitivity (real part)	40.312
Relative permitivity (imaginary part)	20.112
Conductivity (S/m)	0.879

C. SAR Surface and Volume

SURFACE SAR	VOLUME SAR
	

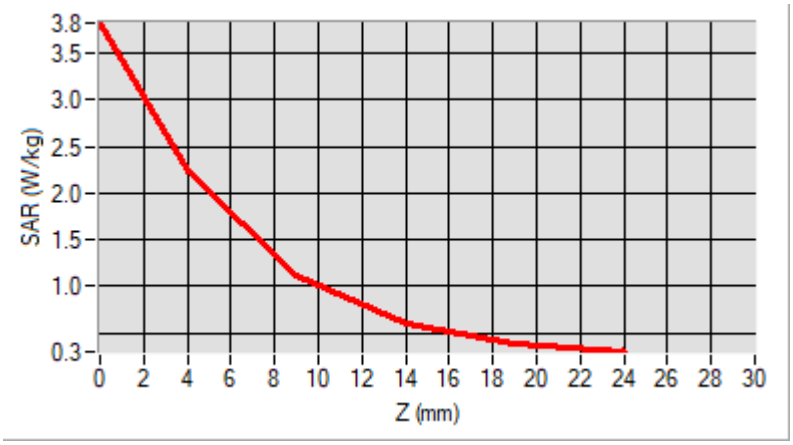
Maximum location: X=-15.00, Y=-13.00 ; SAR Peak: 3.98 W/kg

D. SAR 1g & 10g

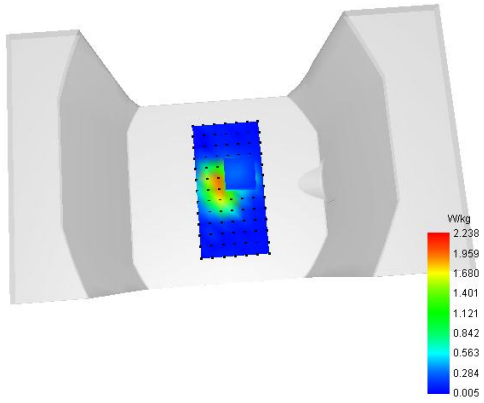
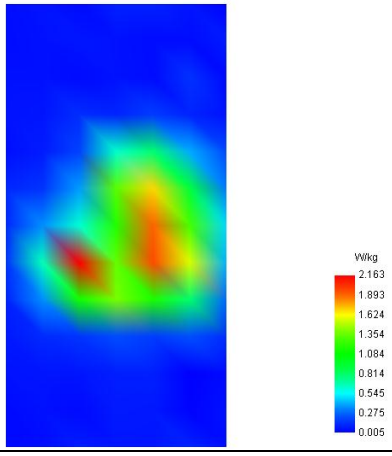
SAR 10g (W/Kg)	0.517
SAR 1g (W/Kg)	0.758
Variation (%)	-0.560
Horizontal validation criteria: minimum distance (mm)	0.000000
Vertical validation criteria: SAR ratio M2/M1 (%)	0.000000

E. Z Axis Scan

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	3.823	2.238	1.119	0.601	0.393



F. 3D Image

3D screen shot	Hot spot position
	

Plot 5

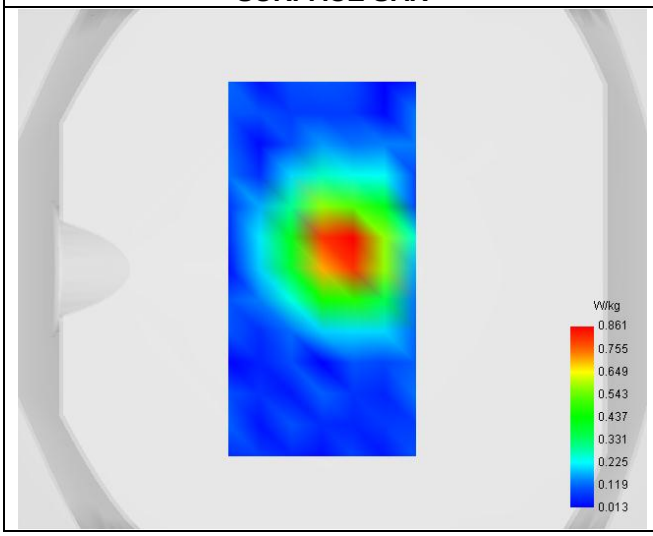
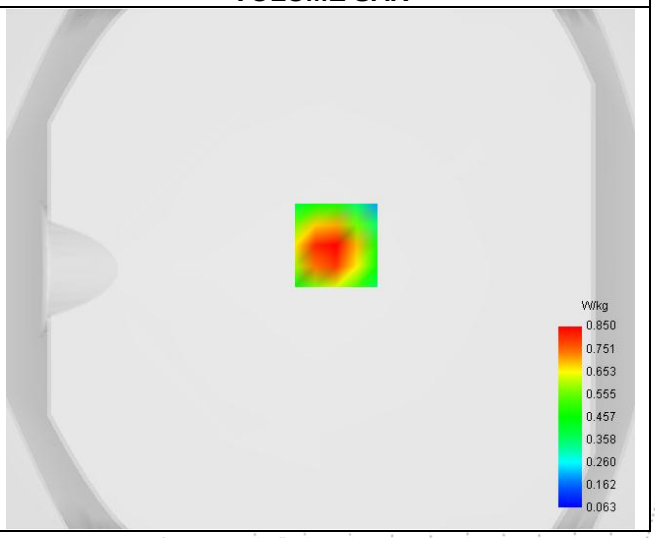
A. Experimental conditions.

Probe	SN 26/23 EPGO420
ConvF	1.04
Area Scan	surf_sam_plan.txt
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm,Very fast
Phantom	Validation plane
Device Position	Body
Band	LTE band 2
Channels	19100
Signal	LTE (Crest factor: 1.0)

B. Permitivity

Frequency (MHz)	1900.000
Relative permitivity (real part)	40.002
Relative permitivity (imaginary part)	13.408
Conductivity (S/m)	1.387

C. SAR Surface and Volume

SURFACE SAR	VOLUME SAR
	

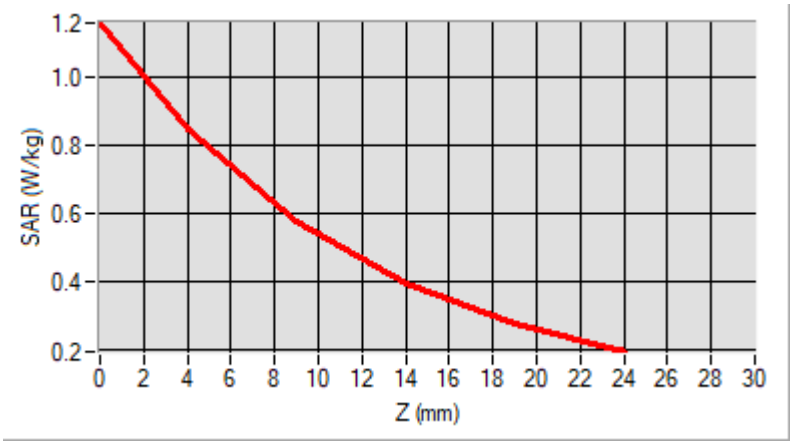
Maximum location: X=6.00, Y=9.00 ; SAR Peak: 1.19 W/kg

D. SAR 1g & 10g

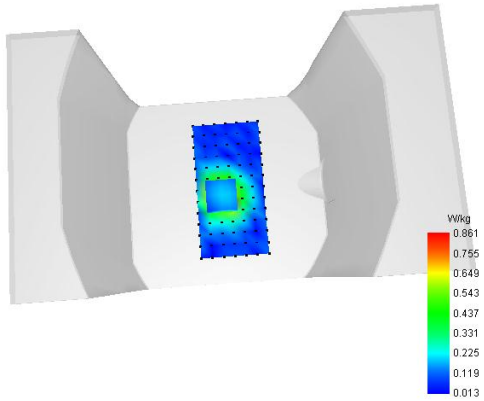
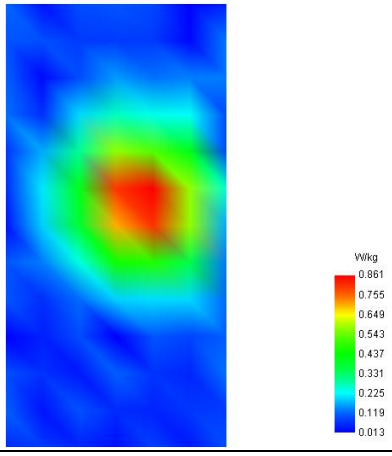
SAR 10g (W/Kg)	0.507
SAR 1g (W/Kg)	0.813
Variation (%)	-1.580
Horizontal validation criteria: minimum distance (mm)	0.000000
Vertical validation criteria: SAR ratio M2/M1 (%)	0.000000

E. Z Axis Scan

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	1.158	0.850	0.576	0.397	0.280



F. 3D Image

3D screen shot	Hot spot position
	

Plot 6

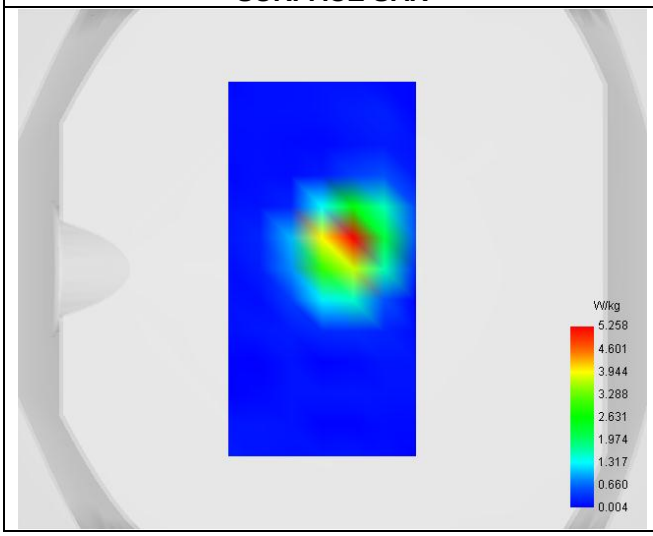
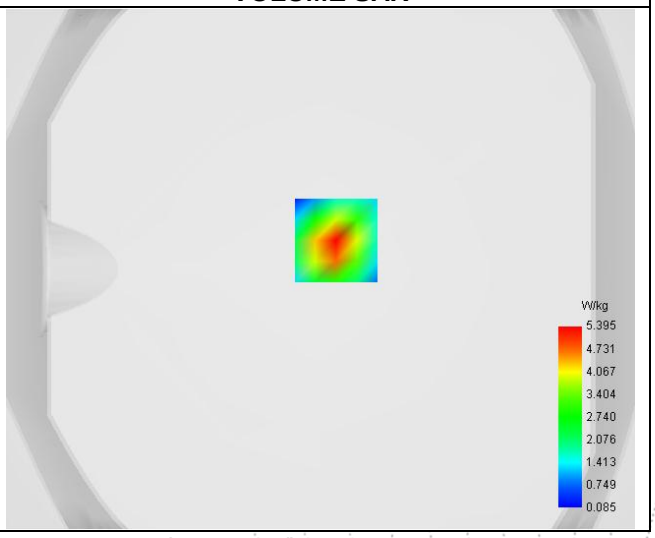
A. Experimental conditions.

Probe	SN 26/23 EPGO420
ConvF	0.96
Area Scan	surf_sam_plan.txt
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Phantom	Validation plane
Device Position	Body
Band	LTE band 4
Channels	Middle (20175)
Signal	LTE (Crest factor: 1.0)

B. Permitivity

Frequency (MHz)	1732.500
Relative permitivity (real part)	40.116
Relative permitivity (imaginary part)	14.136
Conductivity (S/m)	1.361

C. SAR Surface and Volume

SURFACE SAR	VOLUME SAR
	

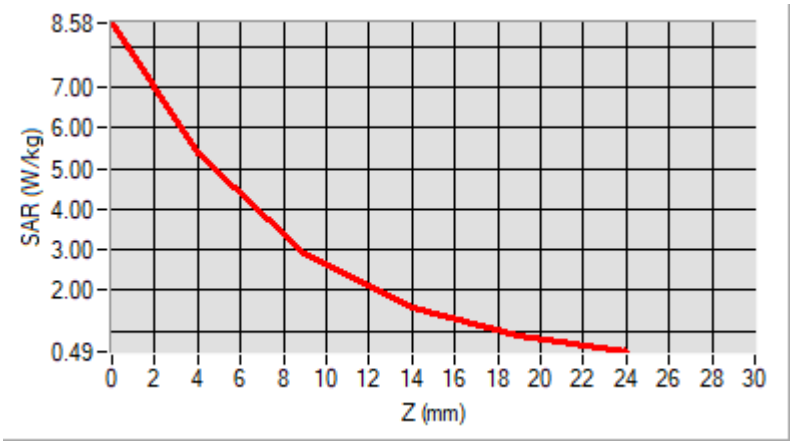
Maximum location: X=6.00, Y=11.00 ; SAR Peak: 8.62 W/kg

D. SAR 1g & 10g

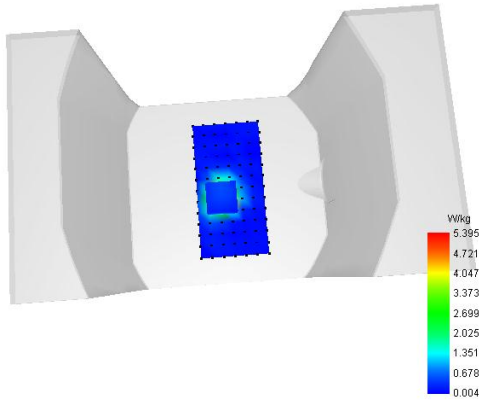
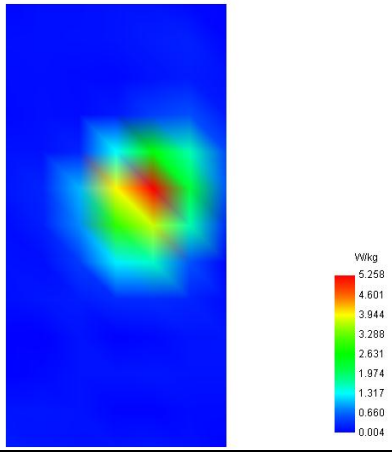
SAR 10g (W/Kg)	0.643
SAR 1g (W/Kg)	0.977
Variation (%)	-4.010
Horizontal validation criteria: minimum distance (mm)	0.000000
Vertical validation criteria: SAR ratio M2/M1 (%)	0.000000

E. Z Axis Scan

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	8.581	5.395	2.925	1.584	0.892



F. 3D Image

3D screen shot	Hot spot position
	

Plot 7

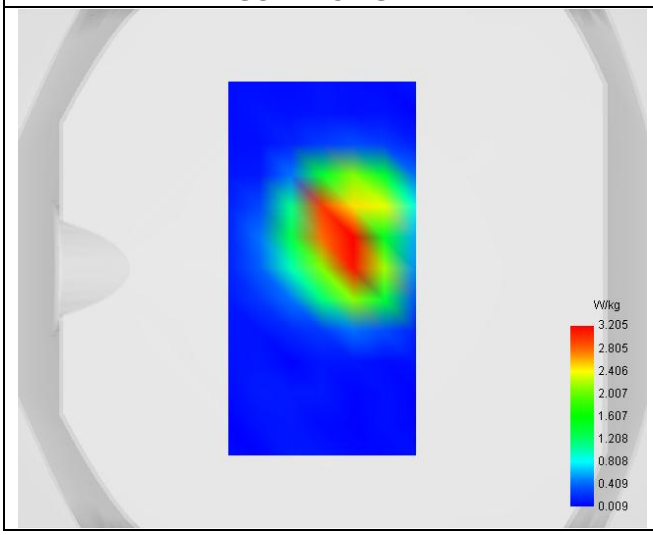
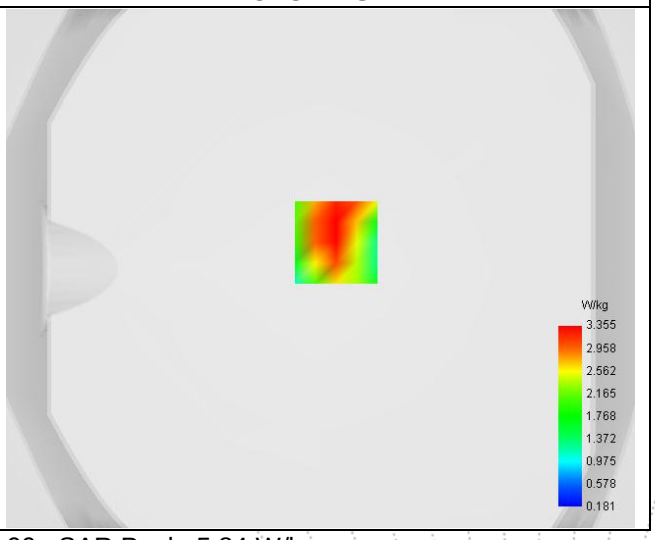
A. Experimental conditions.

Probe	SN 26/23 EPGO420
ConvF	0.81
Area Scan	surf_sam_plan.txt
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Phantom	Validation plane
Device Position	Body
Band	LTE band 5
Channels	Middle (20525)
Signal	LTE (Crest factor: 1.0)

B. Permitivity

Frequency (MHz)	836.500
Relative permitivity (real part)	40.312
Relative permitivity (imaginary part)	20.225
Conductivity (S/m)	0.879

C. SAR Surface and Volume

SURFACE SAR	VOLUME SAR
	

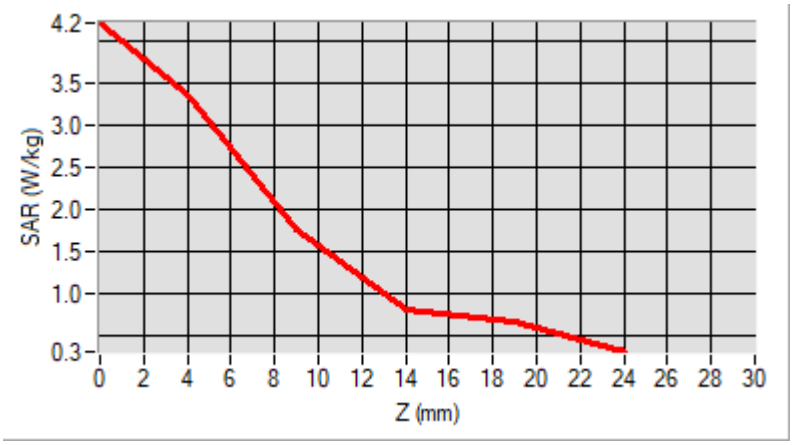
Maximum location: X=6.00, Y=10.00 ; SAR Peak: 5.84 W/kg

D. SAR 1g & 10g

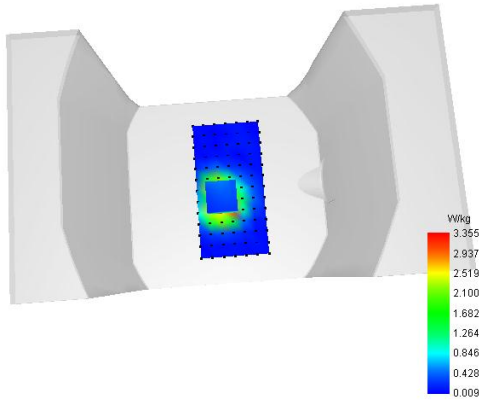
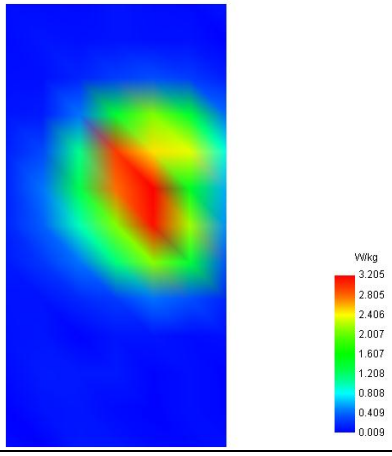
SAR 10g (W/Kg)	0.350
SAR 1g (W/Kg)	0.649
Variation (%)	-3.310
Horizontal validation criteria: minimum distance (mm)	0.000000
Vertical validation criteria: SAR ratio M2/M1 (%)	0.000000

E. Z Axis Scan

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	4.213	3.355	1.753	0.799	0.662



F. 3D Image

3D screen shot	Hot spot position
	

Plot 8

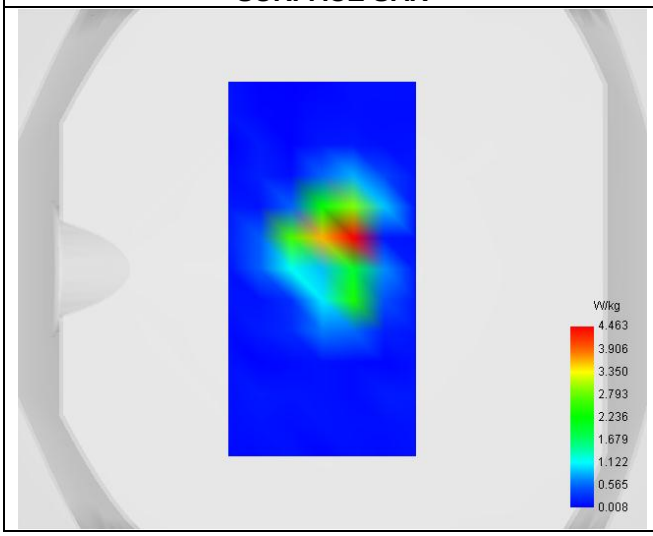
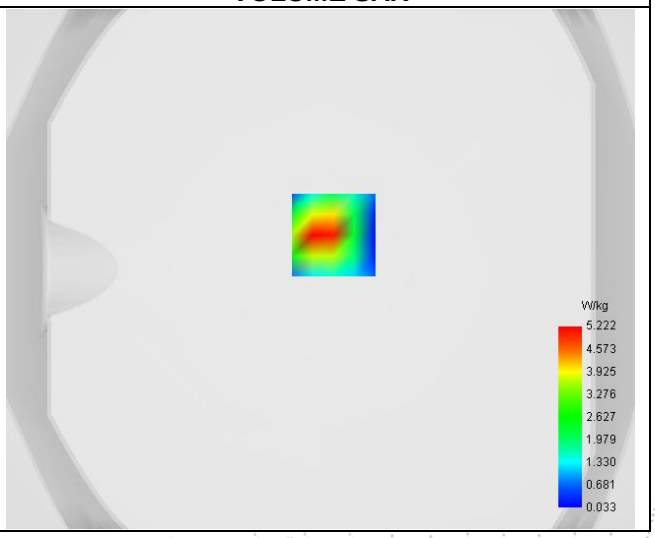
A. Experimental conditions.

Probe	SN 26/23 EPGO420
ConvF	1.03
Area Scan	surf_sam_plan.txt
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Phantom	Validation plane
Device Position	Body
Band	LTE band 7
Channels	21350
Signal	LTE (Crest factor: 1.0)

B. Permitivity

Frequency (MHz)	2560.000
Relative permitivity (real part)	39.087
Relative permitivity (imaginary part)	13.418
Conductivity (S/m)	1.890

C. SAR Surface and Volume

SURFACE SAR	VOLUME SAR
	

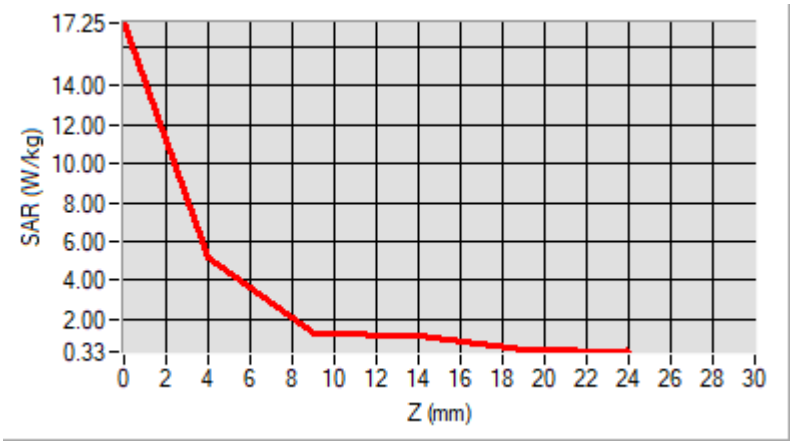
Maximum location: X=5.00, Y=13.00 ; SAR Peak: 9.57 W/kg

D. SAR 1g & 10g

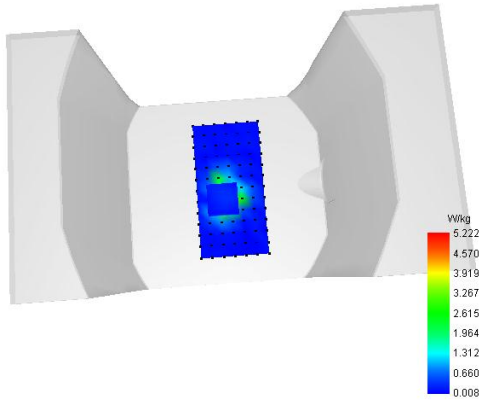
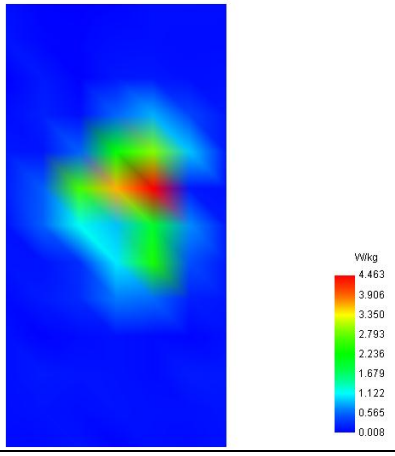
SAR 10g (W/Kg)	0.219
SAR 1g (W/Kg)	0.574
Variation (%)	-4.320
Horizontal validation criteria: minimum distance (mm)	0.000000
Vertical validation criteria: SAR ratio M2/M1 (%)	0.000000

E. Z Axis Scan

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	17.248	5.222	1.306	1.112	0.425



F. 3D Image

3D screen shot	Hot spot position
	

Plot 9

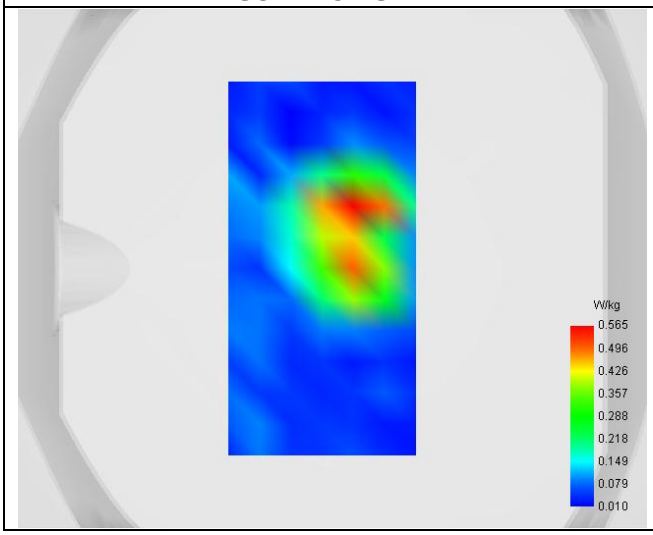
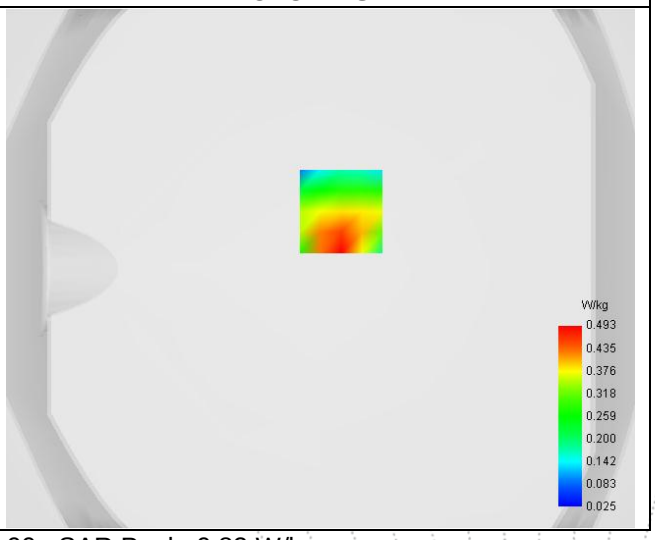
A. Experimental conditions.

Probe	SN 26/23 EPGO420
ConvF	0.80
Area Scan	surf_sam_plan.txt
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Phantom	Validation plane
Device Position	Body
Band	LTE band 12
Channels	Higher (23130)
Signal	LTE (Crest factor: 1.0)

B. Permitivity

Frequency (MHz)	711.000
Relative permitivity (real part)	42.889
Relative permitivity (imaginary part)	23.107
Conductivity (S/m)	0.878

C. SAR Surface and Volume

SURFACE SAR	VOLUME SAR
	

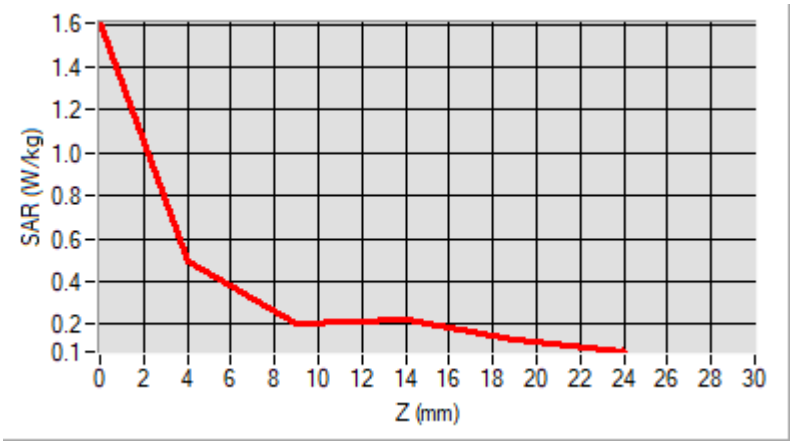
Maximum location: X=8.00, Y=22.00 ; SAR Peak: 0.82 W/kg

D. SAR 1g & 10g

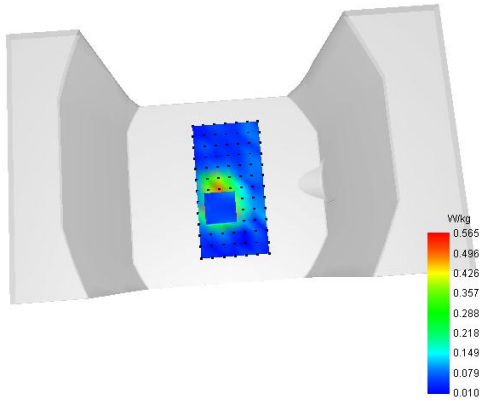
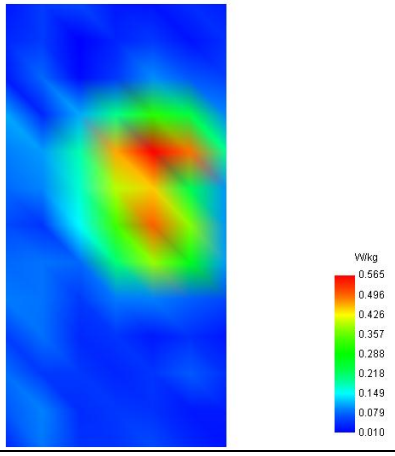
SAR 10g (W/Kg)	0.245
SAR 1g (W/Kg)	0.489
Variation (%)	3.120
Horizontal validation criteria: minimum distance (mm)	0.000000
Vertical validation criteria: SAR ratio M2/M1 (%)	0.000000

E. Z Axis Scan

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	1.605	0.493	0.200	0.222	0.132



F. 3D Image

3D screen shot	Hot spot position
	

Plot 10

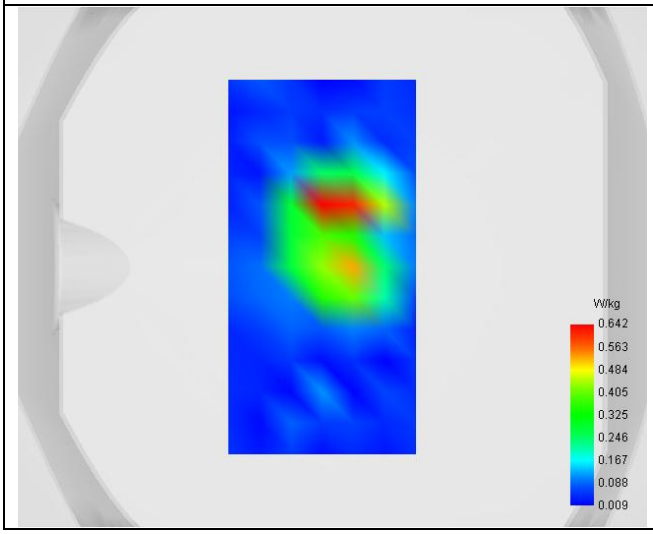
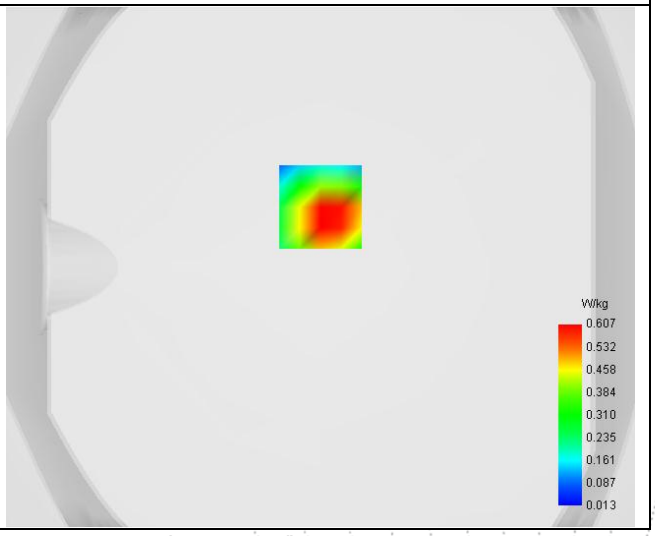
A. Experimental conditions.

Probe	SN 26/23 EPGO420
ConvF	0.80
Area Scan	surf_sam_plan.txt
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm,Very fast
Phantom	Validation plane
Device Position	Body
Band	LTE band 17
Channels	Middle (23790)
Signal	LTE (Crest factor: 1.0)

B. Permitivity

Frequency (MHz)	710.000
Relative permitivity (real part)	42.113
Relative permitivity (imaginary part)	23.152
Conductivity (S/m)	0.913

C. SAR Surface and Volume

SURFACE SAR	VOLUME SAR
	

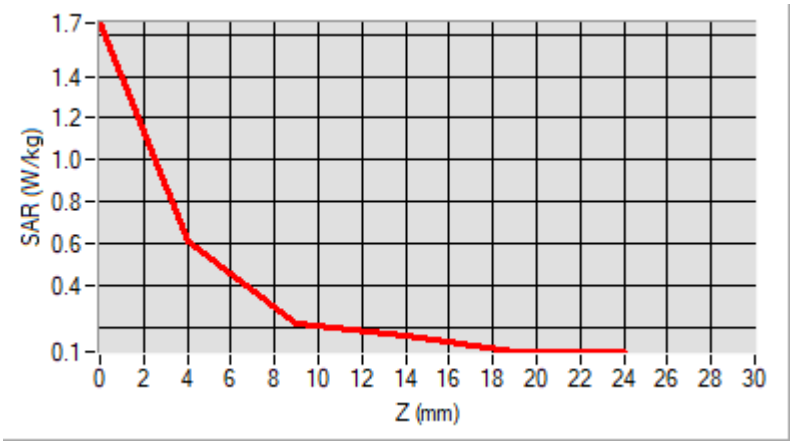
Maximum location: X=0.00, Y=23.00 ; SAR Peak: 1.21 W/kg

D. SAR 1g & 10g

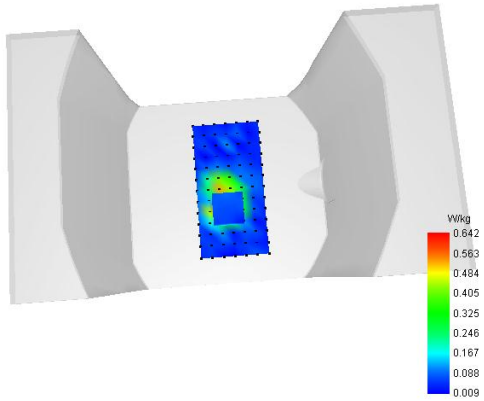
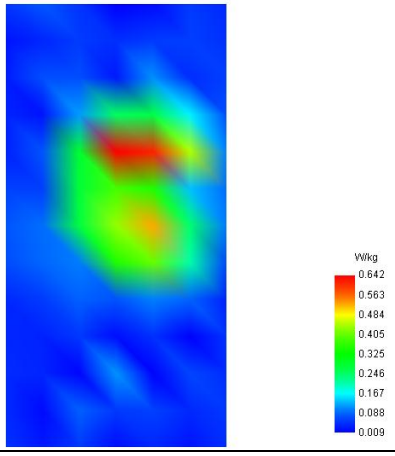
SAR 10g (W/Kg)	0.319
SAR 1g (W/Kg)	0.624
Variation (%)	-2.540
Horizontal validation criteria: minimum distance (mm)	0.000000
Vertical validation criteria: SAR ratio M2/M1 (%)	0.000000

E. Z Axis Scan

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	1.656	0.607	0.214	0.153	0.082



F. 3D Image

3D screen shot	Hot spot position
	

Plot 11

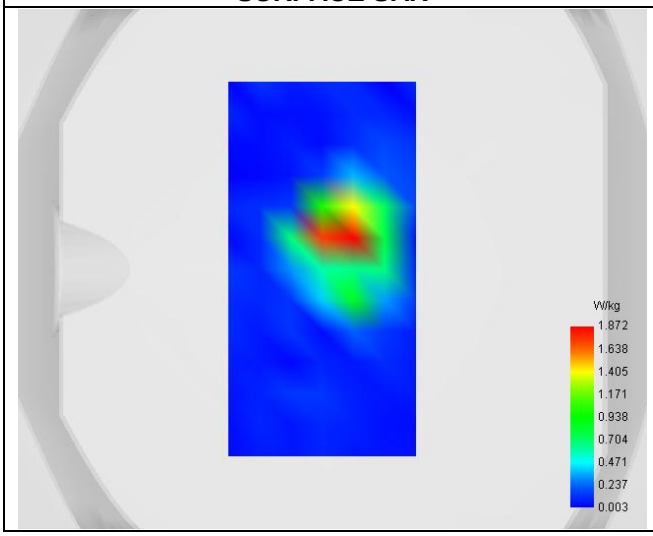
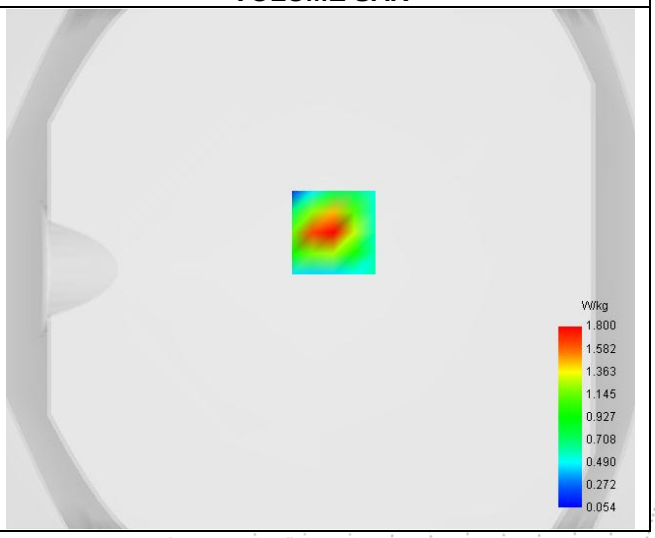
A. Experimental conditions.

Probe	SN 26/23 EPGO420
ConvF	1.03
Area Scan	surf_sam_plan.txt
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Phantom	Validation plane
Device Position	Body
Band	LTE band 38
Channels	Middle (38000)
Signal	LTE (Crest factor: 1.0)

B. Permitivity

Frequency (MHz)	2595.000
Relative permitivity (real part)	39.045
Relative permitivity (imaginary part)	13.558
Conductivity (S/m)	1.929

C. SAR Surface and Volume

SURFACE SAR	VOLUME SAR
	

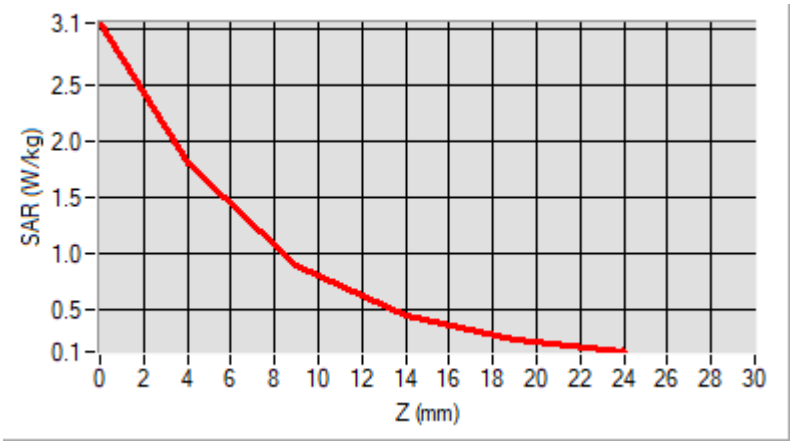
Maximum location: X=5.00, Y=14.00 ; SAR Peak: 3.11 W/kg

D. SAR 1g & 10g

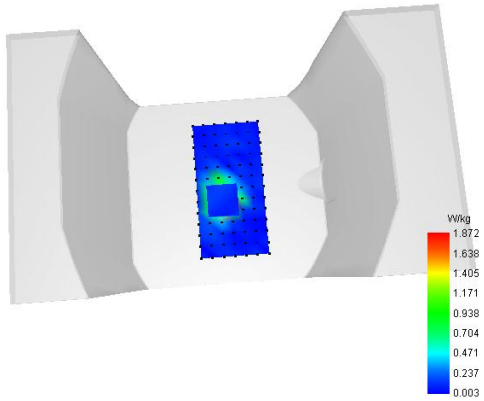
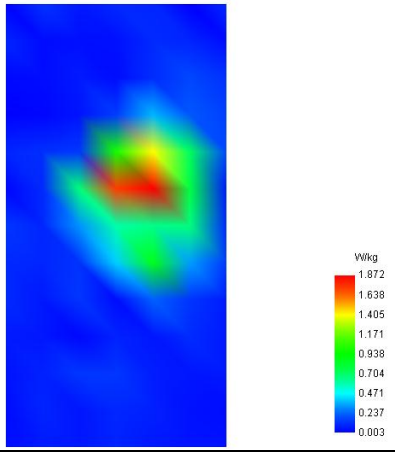
SAR 10g (W/Kg)	0.494
SAR 1g (W/Kg)	0.998
Variation (%)	-3.280
Horizontal validation criteria: minimum distance (mm)	0.000000
Vertical validation criteria: SAR ratio M2/M1 (%)	0.000000

E. Z Axis Scan

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	3.051	1.800	0.888	0.437	0.231



F. 3D Image

3D screen shot	Hot spot position
	

Plot 12

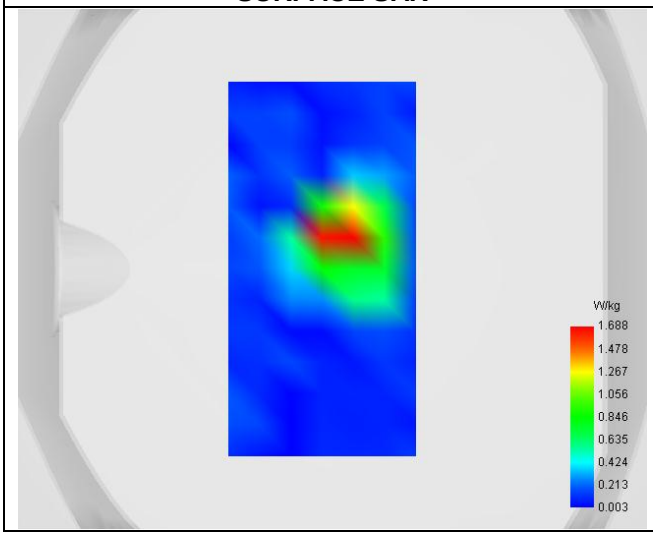
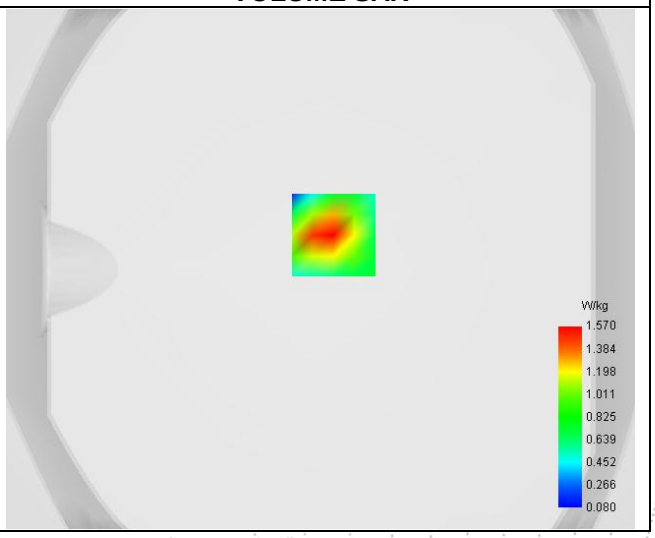
A. Experimental conditions.

Probe	SN 26/23 EPGO420
ConvF	1.03
Area Scan	surf_sam_plan.txt
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Phantom	Validation plane
Device Position	Body
Band	LTE band 41
Channels	40620
Signal	LTE (Crest factor: 1.0)

B. Permitivity

Frequency (MHz)	2593.000
Relative permitivity (real part)	39.045
Relative permitivity (imaginary part)	13.442
Conductivity (S/m)	1.929

C. SAR Surface and Volume

SURFACE SAR	VOLUME SAR
	

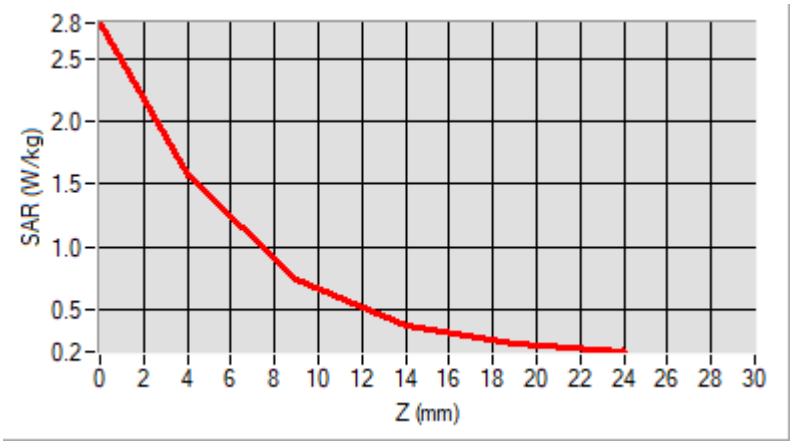
Maximum location: X=5.00, Y=13.00 ; SAR Peak: 2.87 W/kg

D. SAR 1g & 10g

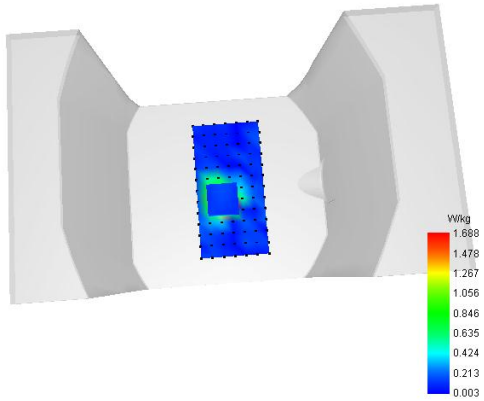
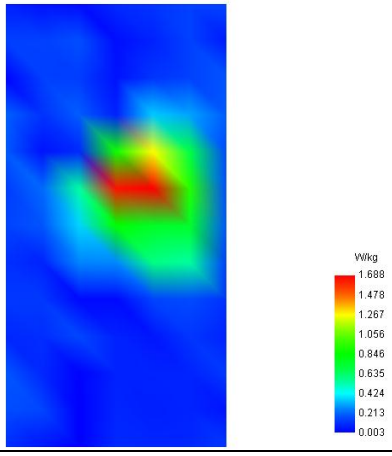
SAR 10g (W/Kg)	0.541
SAR 1g (W/Kg)	0.998
Variation (%)	-2.880
Horizontal validation criteria: minimum distance (mm)	0.000000
Vertical validation criteria: SAR ratio M2/M1 (%)	0.000000

E. Z Axis Scan

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	2.787	1.570	0.735	0.365	0.223



F. 3D Image

3D screen shot	Hot spot position
	

Plot 13

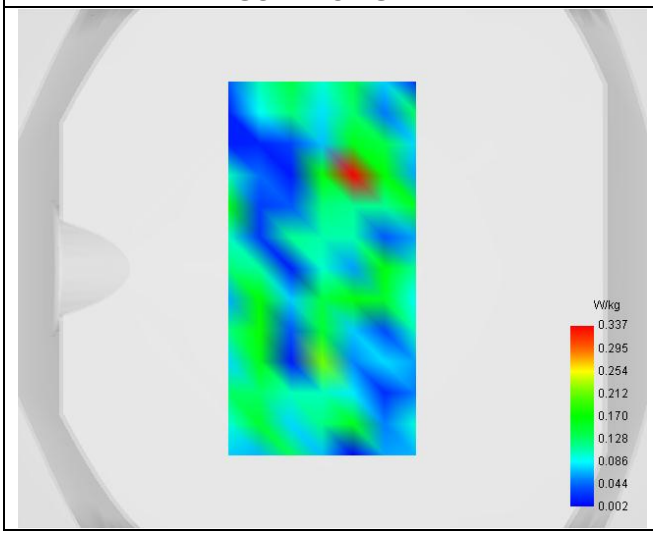
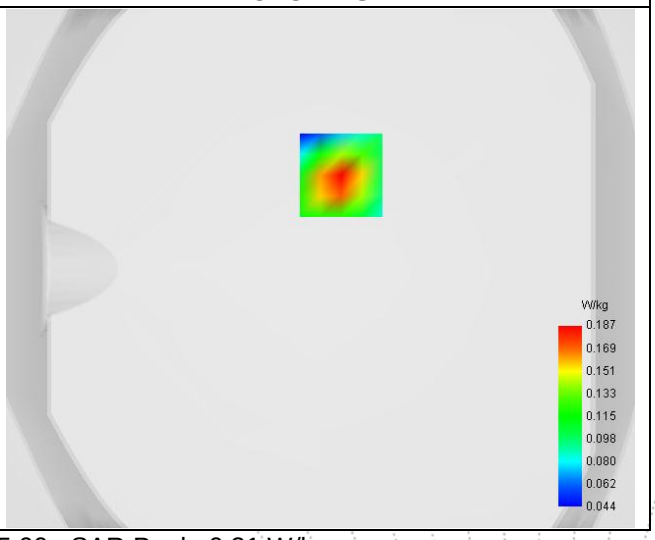
A. Experimental conditions.

Probe	SN 26/23 EPGO420
ConvF	1.11
Area Scan	surf_sam_plan.txt
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Phantom	Validation plane
Device Position	Body
Band	IEEE 802.11b ISM
Channels	Middle (6)
Signal	IEEE802.b (Crest factor: 1.0)

B. Permitivity

Frequency (MHz)	2437.000
Relative permitivity (real part)	39.679
Relative permitivity (imaginary part)	13.212
Conductivity (S/m)	1.749

C. SAR Surface and Volume

SURFACE SAR	VOLUME SAR
	

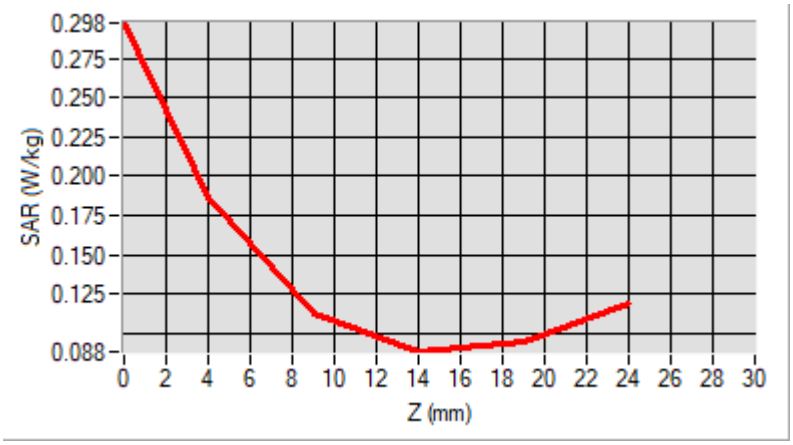
Maximum location: X=-24.00, Y=35.00 ; SAR Peak: 0.31 W/kg

D. SAR 1g & 10g

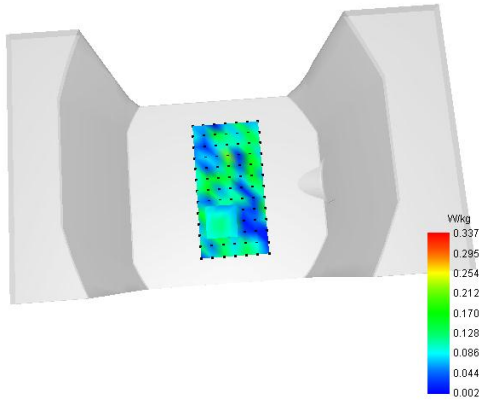
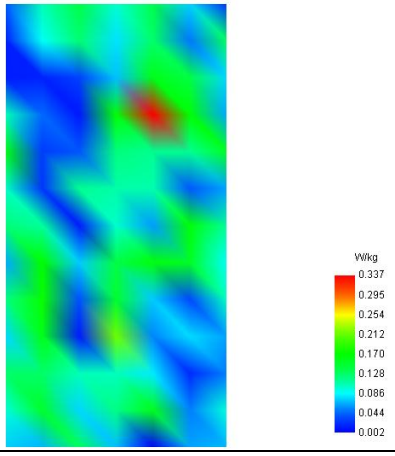
SAR 10g (W/Kg)	0.080
SAR 1g (W/Kg)	0.156
Variation (%)	4.480
Horizontal validation criteria: minimum distance (mm)	0.000000
Vertical validation criteria: SAR ratio M2/M1 (%)	0.000000

E. Z Axis Scan

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.007	0.149	0.097	0.055	0.099



F. 3D Image

3D screen shot	Hot spot position
	

16. CALIBRATION CERTIFICATES

Probe-EPGO420 Calibration Certificate
SID750Dipole Calibration Ceriticate
SID835Dipole Calibration Ceriticate
SID1800Dipole Calibration Ceriticate
SID1900Dipole Calibration Ceriticate
SID2450Dipole Calibration Ceriticate
SID2600Dipole Calibration Ceriticate

COMOSAR E-Field Probe Calibration Report

Ref : ACR.199.1.23.BES.A

SHENZHEN BCTC TECHNOLOGY CO., LTD.
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MVG COMOSAR DOSIMETRIC E-FIELD PROBE
SERIAL NO.: 2623-EPGO-420

Calibrated at MVG
Z.I. de la pointe du diable
Technopôle Brest Iroise – 295 avenue Alexis de Rochon
29280 PLOUZANE - FRANCE

Calibration date: 7/18/2023

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

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).

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COMOSAR E-FIELD PROBE CALIBRATION REPORT

Ref: ACR.199.1.23.BES.A

	Name	*Function*	*Date*	*Signature*
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	Customer Name
Distribution :	Shenzhen BCTC Technology Co., Ltd.

Issue	*Name*	*Date*	*Modifications*
A	Cyrille ONNEE	7/18/2023	Initial release

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1 DEVICE UNDER TEST

Device Under Test	
Device Type	COMOSAR DOSIMETRIC E FIELD PROBE
Manufacturer	MVG
Model	SSE2
Serial Number	2623-EPGO-420
Product Condition (new / used)	New
Frequency Range of Probe	0.15 GHz-7.5GHz
Resistance of Three Dipoles at Connector	Dipole 1: R1=0.228 MΩ Dipole 2: R2=0.238 MΩ Dipole 3: R3=0.230 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	24.5 mm
Maximum external diameter	8 mm
Probe Tip External Diameter	2.55 mm
Distance between dipoles / probe extremity	12.7 mm

3 MEASUREMENT METHOD

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

3.1 SENSITIVITY

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

3.2 LINEARITY

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

3.3 ISOTROPY

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

3.4 BOUNDARY EFFECT

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

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

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

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

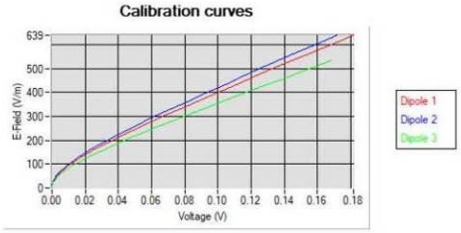
The estimated expanded uncertainty (k=2) in calibration for SAR (W/kg) is +/-11% for the frequency range 150-450MHz.
The estimated expanded uncertainty (k=2) in calibration for SAR (W/kg) is +/-14% for the frequency range 600-7500MHz.

5 CALIBRATION RESULTS

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

5.1 CALIBRATION IN AIR

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



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

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

where
Vi=voltage readings on the 3 channels of the probe
DCPi=diode compression point given below for the 3 channels of the probe
Normi=dipole sensitivity given below for the 3 channels of the probe