

15 SAR Measurement Variability

SAR measurement variability must be assessed for each frequency band, which is determined by the SARprobe calibration point and tissue-equivalent medium used for the device measurements. When both headand body tissue-equivalent media are required for SAR measurements in a frequency band, the variabilitymeasurement procedures should be applied to the tissue medium with the highest measured SAR, usingthe highest measured SAR configuration for that tissue-equivalent medium.

The following procedures are applied to determine if repeatedmeasurements are required.

- 1) Repeated measurement is not required when the original highest measured SAR is < 0.80 W/kg; steps2) through 4) do not apply.
- 2) When the original highest measured SAR is ≥ 0.80 W/kg, repeat that measurement once.
- 3) Perform a second repeated measurement only if the ratio of largest to smallest SAR for the originaland 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).
- 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 repeatedmeasurements is > 1.20.

Table 15.1: SAR Measurement Variability for BodyGSM1900(1g)

Frequency		Test Position	Spacing (mm)	Original SAR (W/kg)	First Repeated SAR (W/kg)	The Ratio	Second Repeated SAR (W/kg)
Ch.	MHz						
512	1850.2	Bottom	10	0.890	0.881	1.01	/

Table 15.2: SAR Measurement Variability for BodyWCDMA1700 (1g)

Frequency		Test Position	Spacing (mm)	Original SAR (W/kg)	First Repeated SAR (W/kg)	The Ratio	Second Repeated SAR (W/kg)
Ch.	MHz						
1738	1752.6	Bottom	10	1.13	1.11	1.02	/

Table 15.3: SAR Measurement Variability for BodyWCDMA1900 (1g)

Frequency		Test Position	Spacing (mm)	Original SAR (W/kg)	First Repeated SAR (W/kg)	The Ratio	Second Repeated SAR (W/kg)
Ch.	MHz						
9800	1880	Bottom	10	1.28	1.25	1.02	/

Table 15.4: SAR Measurement Variability for Body LTE B2 (1g)

Frequency		Mode	Test Position	Spacing (mm)	Original SAR (W/kg)	First Repeated SAR (W/kg)	The Ratio	Second Repeated SAR (W/kg)
Ch.	MHz							
19100	1900	1RB_Low	Bottom	10	1.05	1.02	1.03	/

Table 15.5: SAR Measurement Variability for Body LTE B4 (1g)

Frequency		Mode	Test Position	Spacing (mm)	Original SAR (W/kg)	First Repeated SAR (W/kg)	The Ratio	Second Repeated SAR (W/kg)
Ch.	MHz							
20300	1745	1RB_Low	Bottom	10	1.15	1.13	1.02	/

Table 15.6: SAR Measurement Variability for Body LTE B7 (1g)

Frequency		Mode	Test Position	Spacing (mm)	Original SAR (W/kg)	First Repeated SAR (W/kg)	The Ratio	Second Repeated SAR (W/kg)
Ch.	MHz							
21350	2560	1RB_High	Bottom	10	0.823	0.821	1.00	/

16 Measurement Uncertainty

16.1 Measurement Uncertainty for Normal SAR Tests (300MHz~3GHz)

No.	Error Description	Type	Uncertainty value	Probably Distribution	Div.	(Ci) 1g	(Ci) 10g	Std. Unc. (1g)	Std. Unc. (10g)	Degree of freedom
Measurement system										
1	Probe calibration	B	6.0	N	1	1	1	6.0	6.0	∞
2	Isotropy	B	4.7	R	$\sqrt{3}$	0.7	0.7	1.9	1.9	∞
3	Boundary effect	B	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	∞
4	Linearity	B	4.7	R	$\sqrt{3}$	1	1	2.7	2.7	∞
5	Detection limit	B	1.0	N	1	1	1	0.6	0.6	∞
6	Readout electronics	B	0.3	R	$\sqrt{3}$	1	1	0.3	0.3	∞
7	Response time	B	0.8	R	$\sqrt{3}$	1	1	0.5	0.5	∞
8	Integration time	B	2.6	R	$\sqrt{3}$	1	1	1.5	1.5	∞
9	RF ambient conditions-noise	B	0	R	$\sqrt{3}$	1	1	0	0	∞
10	RF ambient conditions-reflection	B	0	R	$\sqrt{3}$	1	1	0	0	∞
11	Probe positioned mech. restrictions	B	0.4	R	$\sqrt{3}$	1	1	0.2	0.2	∞
12	Probe positioning with respect to phantom shell	B	2.9	R	$\sqrt{3}$	1	1	1.7	1.7	∞
13	Post-processing	B	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	∞
Test sample related										
14	Test sample positioning	A	3.3	N	1	1	1	3.3	3.3	71
15	Device holder uncertainty	A	3.4	N	1	1	1	3.4	3.4	5
16	Drift of output power	B	5.0	R	$\sqrt{3}$	1	1	2.9	2.9	∞
Phantom and set-up										
17	Phantom uncertainty	B	4.0	R	$\sqrt{3}$	1	1	2.3	2.3	∞
18	Liquid conductivity (target)	B	5.0	R	$\sqrt{3}$	0.64	0.43	1.8	1.2	∞
19	Liquid conductivity (meas.)	A	2.06	N	1	0.64	0.43	1.32	0.89	43
20	Liquid permittivity (target)	B	5.0	R	$\sqrt{3}$	0.6	0.49	1.7	1.4	∞
21	Liquid permittivity (meas.)	A	1.6	N	1	0.6	0.49	1.0	0.8	521

Combined standard uncertainty	$u_c' = \sqrt{\sum_{i=1}^{21} c_i^2 u_i^2}$					9.55	9.43	257
Expanded uncertainty (confidence interval of 95 %)	$u_e = 2u_c$					19.1	18.9	

16.2 Measurement Uncertainty for Normal SAR Tests (3~6GHz)

No.	Error Description	Type	Uncertainty value	Probably Distribution	Div.	(Ci) 1g	(Ci) 10g	Std. Unc. (1g)	Std. Unc. (10g)	Degree of freedom
Measurement system										
1	Probe calibration	B	6.55	N	1	1	1	6.55	6.55	∞
2	Isotropy	B	4.7	R	$\sqrt{3}$	0.7	0.7	1.9	1.9	∞
3	Boundary effect	B	2.0	R	$\sqrt{3}$	1	1	1.2	1.2	∞
4	Linearity	B	4.7	R	$\sqrt{3}$	1	1	2.7	2.7	∞
5	Detection limit	B	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	∞
6	Readout electronics	B	0.3	R	$\sqrt{3}$	1	1	0.3	0.3	∞
7	Response time	B	0.8	R	$\sqrt{3}$	1	1	0.5	0.5	∞
8	Integration time	B	2.6	R	$\sqrt{3}$	1	1	1.5	1.5	∞
9	RF ambient conditions-noise	B	0	R	$\sqrt{3}$	1	1	0	0	∞
10	RFambient conditions-reflection	B	0	R	$\sqrt{3}$	1	1	0	0	∞
11	Probe positioned mech. restrictions	B	0.8	R	$\sqrt{3}$	1	1	0.5	0.5	∞
12	Probe positioning with respect to phantom shell	B	6.7	R	$\sqrt{3}$	1	1	3.9	3.9	∞
13	Post-processing	B	4.0	R	$\sqrt{3}$	1	1	2.3	2.3	∞
Test sample related										
14	Test sample positioning	A	3.3	N	1	1	1	3.3	3.3	71
15	Device holder uncertainty	A	3.4	N	1	1	1	3.4	3.4	5
16	Drift of output power	B	5.0	R	$\sqrt{3}$	1	1	2.9	2.9	∞
Phantom and set-up										
17	Phantom uncertainty	B	4.0	R	$\sqrt{3}$	1	1	2.3	2.3	∞
18	Liquid conductivity (target)	B	5.0	R	$\sqrt{3}$	0.64	0.43	1.8	1.2	∞
19	Liquid conductivity (meas.)	A	2.06	N	1	0.64	0.43	1.32	0.89	43
20	Liquid permittivity	B	5.0	R	$\sqrt{3}$	0.6	0.49	1.7	1.4	∞

	(target)									
21	Liquid permittivity (meas.)	A	1.6	N	1	0.6	0.49	1.0	0.8	521
Combined standard uncertainty		$u_c' = \sqrt{\sum_{i=1}^{21} c_i^2 u_i^2}$						10.7	10.6	257
Expanded uncertainty (confidence interval of 95 %)		$u_e = 2u_c$						21.4	21.1	

16.3 Measurement Uncertainty for Fast SAR Tests (300MHz~3GHz)

No.	Error Description	Type	Uncertainty value	Probably Distribution	Div.	(Ci) 1g	(Ci) 10g	Std. Unc. (1g)	Std. Unc. (10g)	Degree of freedom
Measurement system										
1	Probe calibration	B	6.0	N	1	1	1	6.0	6.0	∞
2	Isotropy	B	4.7	R	$\sqrt{3}$	0.7	0.7	1.9	1.9	∞
3	Boundary effect	B	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	∞
4	Linearity	B	4.7	R	$\sqrt{3}$	1	1	2.7	2.7	∞
5	Detection limit	B	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	∞
6	Readout electronics	B	0.3	R	$\sqrt{3}$	1	1	0.3	0.3	∞
7	Response time	B	0.8	R	$\sqrt{3}$	1	1	0.5	0.5	∞
8	Integration time	B	2.6	R	$\sqrt{3}$	1	1	1.5	1.5	∞
9	RF ambient conditions-noise	B	0	R	$\sqrt{3}$	1	1	0	0	∞
10	RFambient conditions-reflection	B	0	R	$\sqrt{3}$	1	1	0	0	∞
11	Probe positioned mech. Restrictions	B	0.4	R	$\sqrt{3}$	1	1	0.2	0.2	∞
12	Probe positioning with respect to phantom shell	B	2.9	R	$\sqrt{3}$	1	1	1.7	1.7	∞
13	Post-processing	B	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	∞
14	Fast SAR z-Approximation	B	7.0	R	$\sqrt{3}$	1	1	4.0	4.0	∞
Test sample related										
15	Test sample positioning	A	3.3	N	1	1	1	3.3	3.3	71
16	Device holder uncertainty	A	3.4	N	1	1	1	3.4	3.4	5
17	Drift of output power	B	5.0	R	$\sqrt{3}$	1	1	2.9	2.9	∞
Phantom and set-up										
18	Phantom uncertainty	B	4.0	R	$\sqrt{3}$	1	1	2.3	2.3	∞

19	Liquid conductivity (target)	B	5.0	R	$\sqrt{3}$	0.64	0.43	1.8	1.2	∞
20	Liquid conductivity (meas.)	A	2.06	N	1	0.64	0.43	1.32	0.89	43
21	Liquid permittivity (target)	B	5.0	R	$\sqrt{3}$	0.6	0.49	1.7	1.4	∞
22	Liquid permittivity (meas.)	A	1.6	N	1	0.6	0.49	1.0	0.8	521
Combined standard uncertainty		$u_c = \sqrt{\sum_{i=1}^{22} c_i^2 u_i^2}$						10.4	10.3	257
Expanded uncertainty (confidence interval of 95 %)		$u_e = 2u_c$						20.8	20.6	

16.4 Measurement Uncertainty for Fast SAR Tests (3~6GHz)

No.	Error Description	Type	Uncertainty value	Probably Distribution	Div.	(Ci) 1g	(Ci) 10g	Std. Unc. (1g)	Std. Unc. (10g)	Degree of freedom
Measurement system										
1	Probe calibration	B	6.55	N	1	1	1	6.55	6.55	∞
2	Isotropy	B	4.7	R	$\sqrt{3}$	0.7	0.7	1.9	1.9	∞
3	Boundary effect	B	2.0	R	$\sqrt{3}$	1	1	1.2	1.2	∞
4	Linearity	B	4.7	R	$\sqrt{3}$	1	1	2.7	2.7	∞
5	Detection limit	B	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	∞
6	Readout electronics	B	0.3	R	$\sqrt{3}$	1	1	0.3	0.3	∞
7	Response time	B	0.8	R	$\sqrt{3}$	1	1	0.5	0.5	∞
8	Integration time	B	2.6	R	$\sqrt{3}$	1	1	1.5	1.5	∞
9	RF ambient conditions-noise	B	0	R	$\sqrt{3}$	1	1	0	0	∞
10	RF ambient conditions-reflection	B	0	R	$\sqrt{3}$	1	1	0	0	∞
11	Probe positioned mech. Restrictions	B	0.8	R	$\sqrt{3}$	1	1	0.5	0.5	∞
12	Probe positioning with respect to phantom shell	B	6.7	R	$\sqrt{3}$	1	1	3.9	3.9	∞
13	Post-processing	B	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	∞
14	Fast SAR z-Approximation	B	14.0	R	$\sqrt{3}$	1	1	8.1	8.1	∞
Test sample related										
15	Test sample positioning	A	3.3	N	1	1	1	3.3	3.3	71
16	Device holder	A	3.4	N	1	1	1	3.4	3.4	5

	uncertainty									
17	Drift of output power	B	5.0	R	$\sqrt{3}$	1	1	2.9	2.9	∞
Phantom and set-up										
18	Phantom uncertainty	B	4.0	R	$\sqrt{3}$	1	1	2.3	2.3	∞
19	Liquid conductivity (target)	B	5.0	R	$\sqrt{3}$	0.64	0.43	1.8	1.2	∞
20	Liquid conductivity (meas.)	A	2.06	N	1	0.64	0.43	1.32	0.89	43
21	Liquid permittivity (target)	B	5.0	R	$\sqrt{3}$	0.6	0.49	1.7	1.4	∞
22	Liquid permittivity (meas.)	A	1.6	N	1	0.6	0.49	1.0	0.8	521
Combined standard uncertainty		$u'_c = \sqrt{\sum_{i=1}^{22} c_i^2 u_i^2}$						13.5	13.4	257
Expanded uncertainty (confidence interval of 95 %)		$u_e = 2u_c$						27.0	26.8	

17 MAIN TEST INSTRUMENTS

Table 17.1: List of Main Instruments

No.	Name	Type	Serial Number	Calibration Date	Valid Period
01	Network analyzer	E5071C	MY46110673	January 13, 2017	One year
02	Power meter	NRVD	102083	September 22, 2016	One year
03	Power sensor	NRV-Z5	100595		
04	Signal Generator	E4438C	MY49071430	January 13, 2017	One Year
05	Amplifier	60S1G4	0331848	No Calibration Requested	
06	BTS	E5515C	MY50263375	January 16, 2017	One year
07	BTS	CMW500	159890	November 25, 2016	One year
08	E-field Probe	SPEAG EX3DV4	3846	January 13, 2017	One year
09	DAE	SPEAG DAE4	1331	January 19, 2017	One year
10	Dipole Validation Kit	SPEAG D750V3	1017	July 20, 2016	One year
11	Dipole Validation Kit	SPEAG D835V2	4d069	July 20, 2016	One year
12	Dipole Validation Kit	SPEAG D1750V2	1003	July 21, 2016	One year
13	Dipole Validation Kit	SPEAG D1900V2	5d101	July 28, 2016	One year
14	Dipole Validation Kit	SPEAG D2450V2	853	July 25, 2016	One year
15	Dipole Validation Kit	SPEAG D2600V2	1012	July 25, 2016	One year
16	Dipole Validation Kit	SPEAG D5GHzV2	1060	July 27, 2016	One year

END OF REPORT BODY

ANNEX A Graph Results

850 Left Cheek Low

Date: 2017-4-13

Electronics: DAE4 Sn1331

Medium: Head 850 MHz

Medium parameters used (interpolated): $f = 824.2$ MHz; $\sigma = 0.889$ mho/m; $\epsilon_r = 42.14$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.9°C Liquid Temperature: 22.5°C

Communication System: GSM 850 GPRS Frequency: 824.2 MHz Duty Cycle: 1:8.3

Probe: EX3DV4 – SN3846ConvF(9.33, 9.33, 9.33)

Area Scan (71x121x1): Interpolated grid: $dx=1.000$ mm, $dy=1.000$ mm

Maximum value of SAR (interpolated) = 0.227 W/kg

Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=5$ mm, $dy=5$ mm, $dz=5$ mm

Reference Value = 7.269 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 0.266 W/kg

SAR(1 g) = 0.210 W/kg; SAR(10 g) = 0.160 W/kg

Maximum value of SAR (measured) = 0.231 W/kg

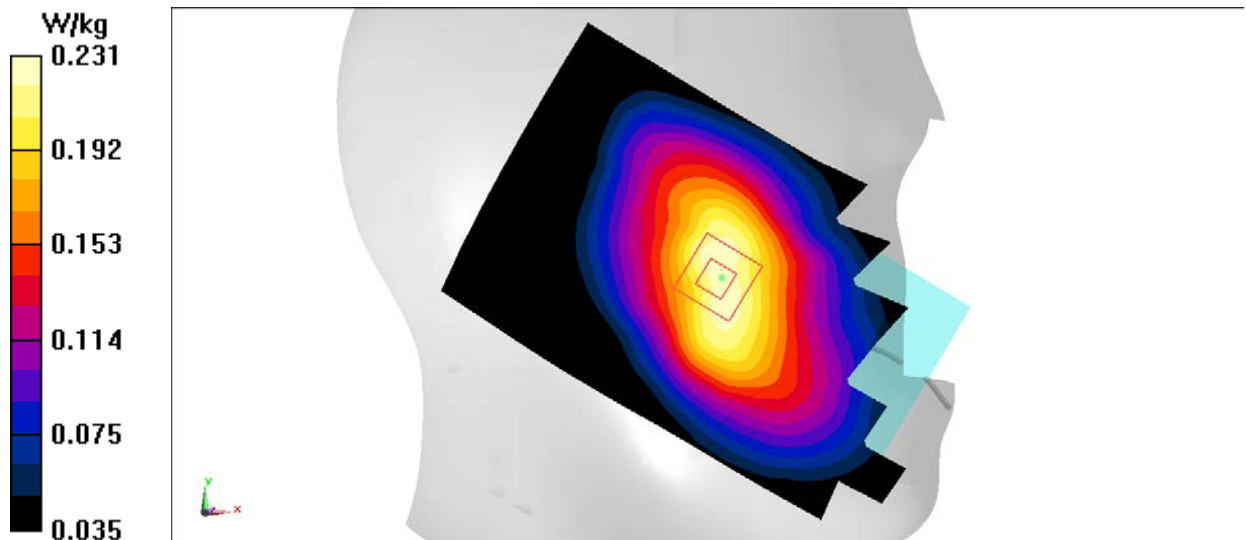


Fig.1 850MHz

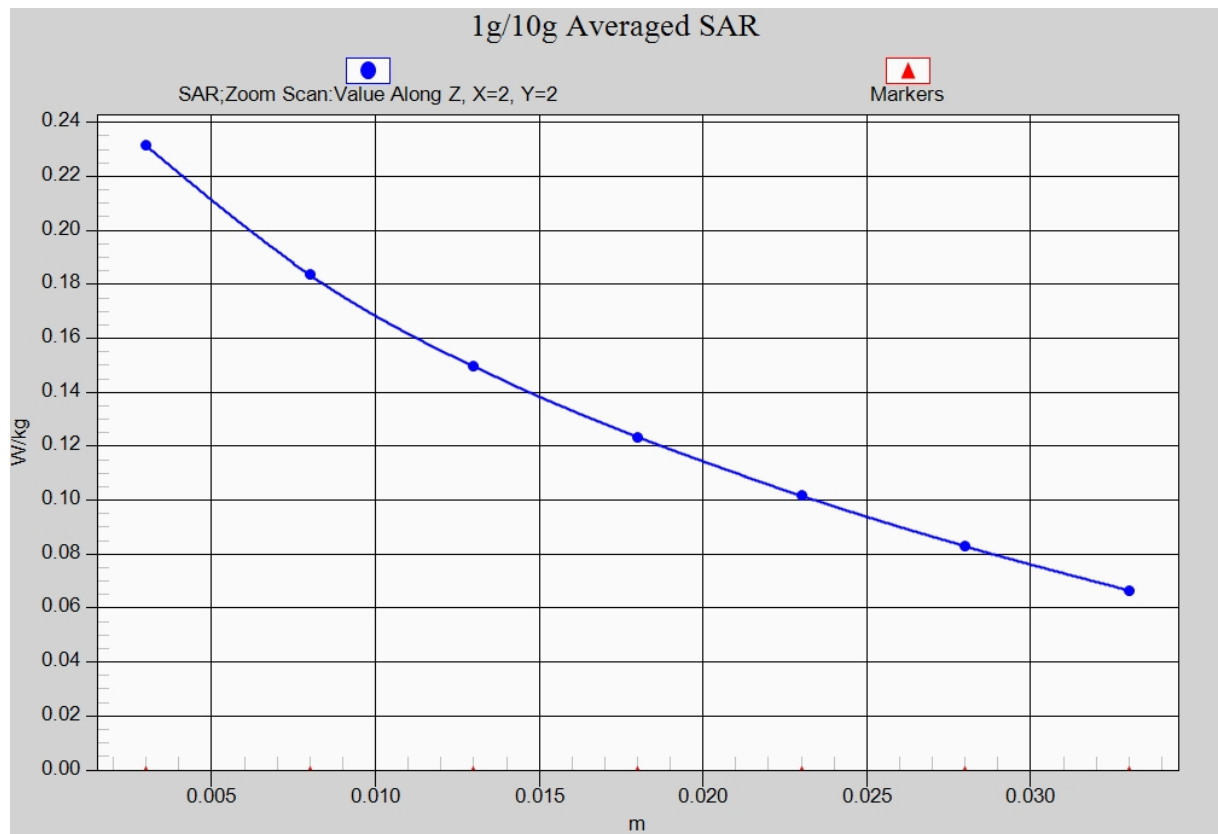


Fig. 1-1 Z-Scan at power reference point (850 MHz)

850Body RearLow

Date: 2017-4-13

Electronics: DAE4 Sn1331

Medium: Body 850 MHz

Medium parameters used (interpolated): $f = 824.2$ MHz; $\sigma = 0.975$ mho/m; $\epsilon_r = 56.83$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.9°C Liquid Temperature: 22.5°C

Communication System: GSM 850 GPRS Frequency: 824.2 MHz Duty Cycle: 1:2

Probe: EX3DV4 – SN3846ConvF(9.52, 9.52, 9.52)

Area Scan (111x61x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.277 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 16.17 V/m; Power Drift = -0.00 dB

Peak SAR (extrapolated) = 0.314 W/kg

SAR(1 g) = 0.255 W/kg; SAR(10 g) = 0.202 W/kg

Maximum value of SAR (measured) = 0.277 W/kg

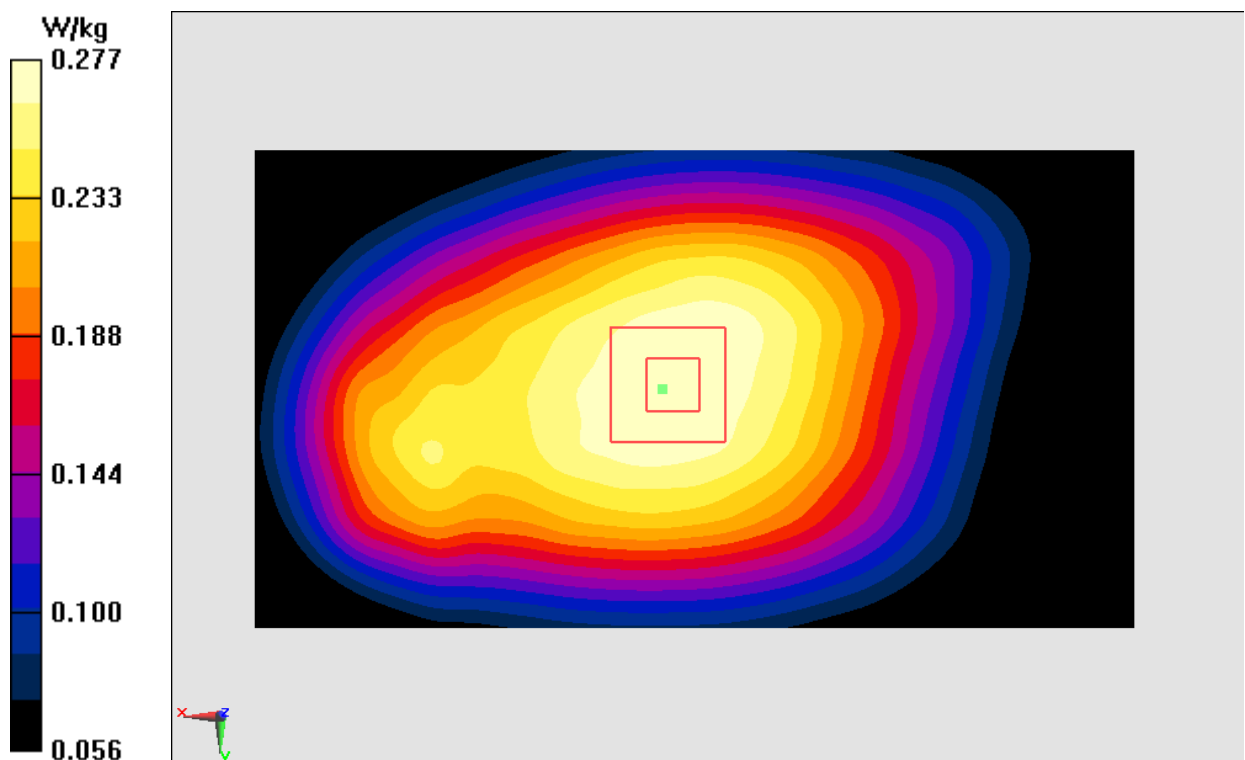


Fig.2 850 MHz

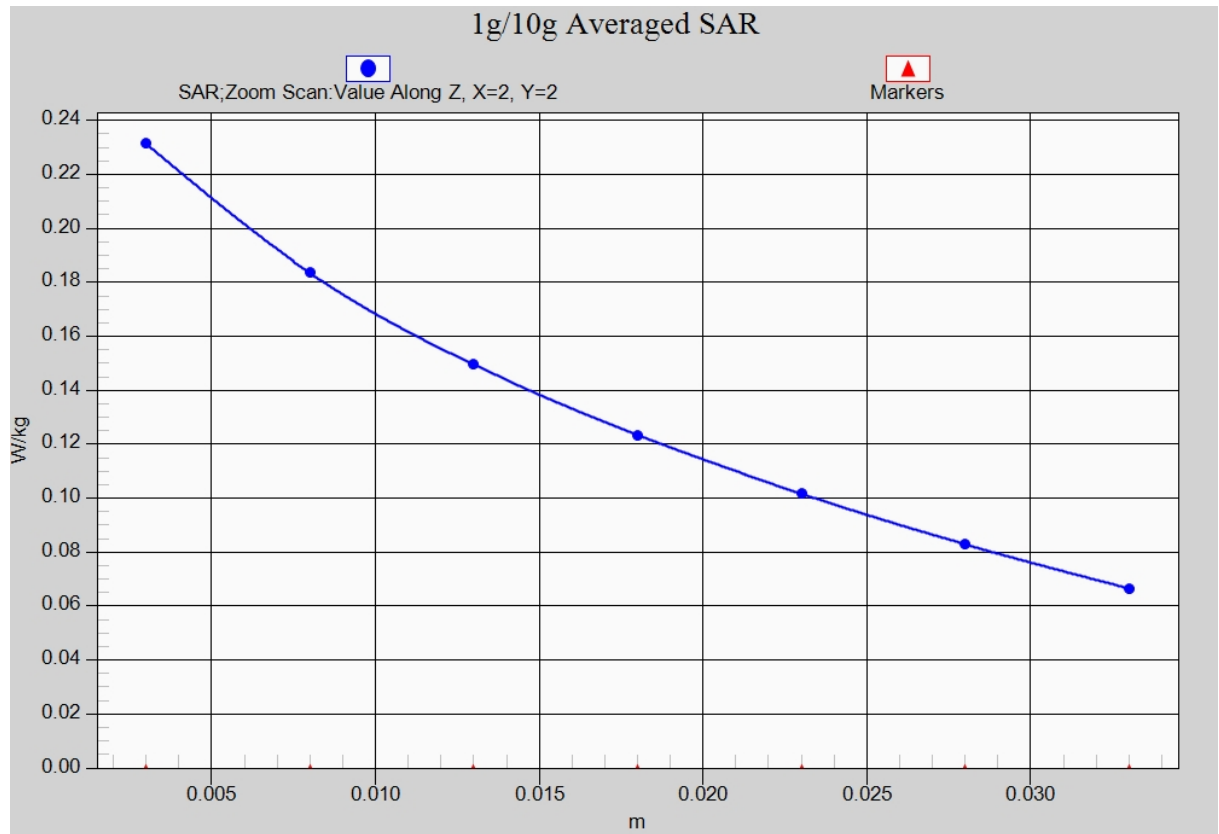


Fig. 2-1Z-Scan at power reference point (850 MHz)

1900 Left Cheek Low

Date: 2017-4-15

Electronics: DAE4 Sn1331

Medium: Head 1900 MHz

Medium parameters used (interpolated): $f = 1850.2$ MHz; $\sigma = 1.354$ mho/m; $\epsilon_r = 40.59$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.9°C Liquid Temperature: 22.5°C

Communication System: GSM 1900MHz GRPS Frequency: 1850.2 MHz Duty Cycle: 1:8.3

Probe: EX3DV4- SN3846 ConvF(7.89, 7.89, 7.89)

Area Scan (71x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.115 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 3.335 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 0.147 W/kg

SAR(1 g) = 0.095 W/kg; SAR(10 g) = 0.060 W/kg

Maximum value of SAR (measured) = 0.113 W/kg

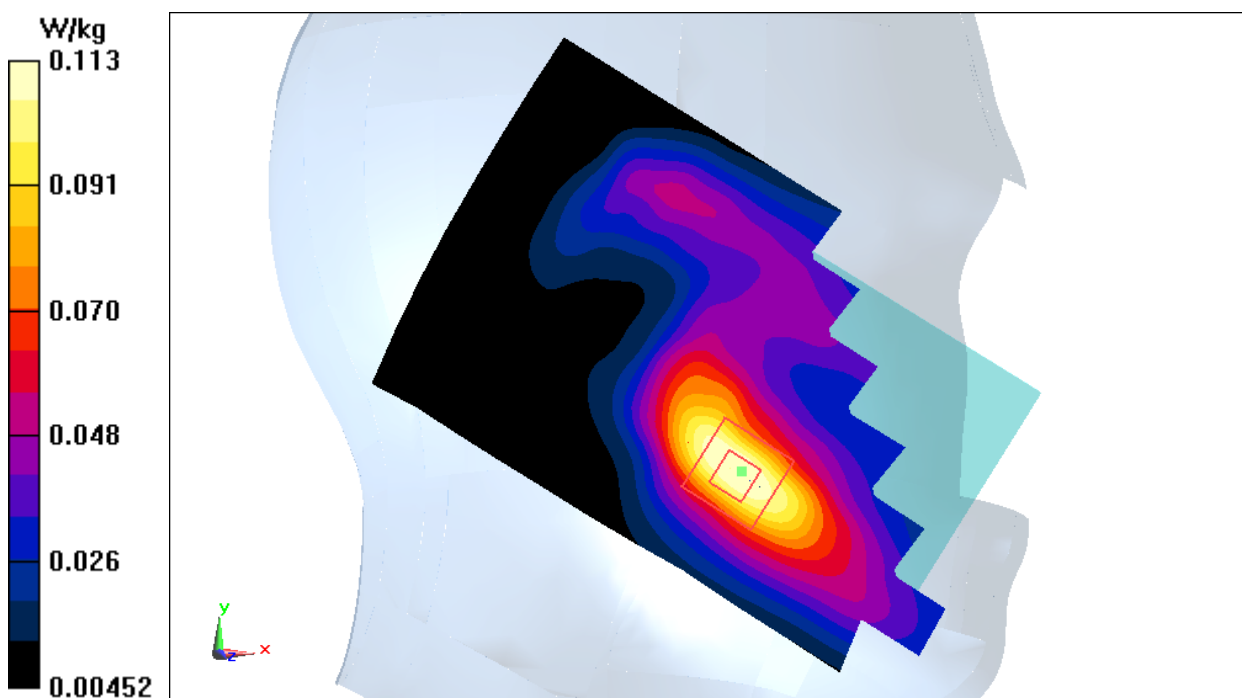


Fig.3 1900 MHz

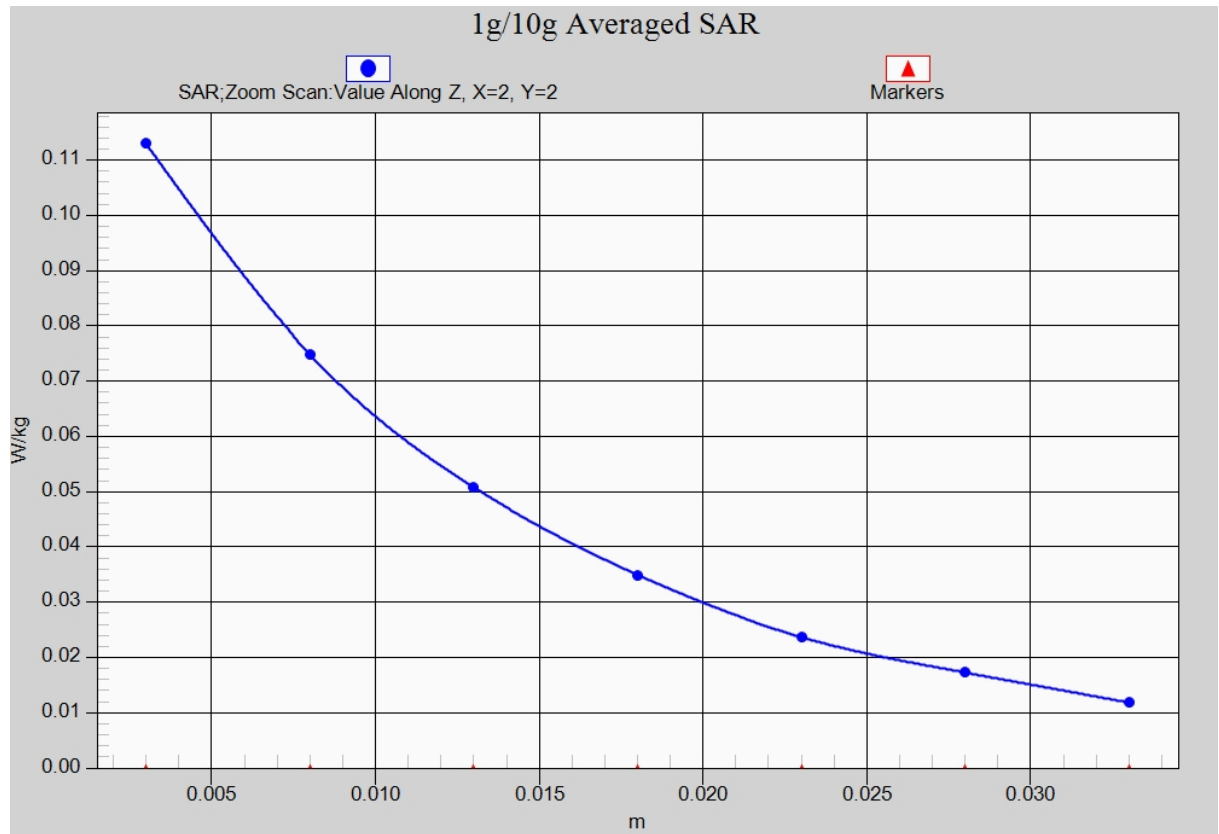


Fig. 3-1Z-Scan at power reference point (1900 MHz)

1900 Body BottomLow

Date: 2017-4-15

Electronics: DAE4 Sn1331

Medium: Body 1900 MHz

Medium parameters used: $f = 1850.2$ MHz; $\sigma = 1.496$ mho/m; $\epsilon_r = 54.58$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.9°C Liquid Temperature: 22.5°C

Communication System: GSM 1900MHz GPRS Frequency: 1850.2 MHz Duty Cycle: 1:2

Probe: EX3DV4- SN3846 ConvF(7.57, 7.57, 7.57)

Area Scan (111x61x1): Interpolated grid: $dx=1.000$ mm, $dy=1.000$ mm

Maximum value of SAR (interpolated) = 1.13 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5$ mm, $dy=5$ mm, $dz=5$ mm

Reference Value = 23.85 V/m; Power Drift = -0.12 dB

Peak SAR (extrapolated) = 1.54 W/kg

SAR(1 g) = 0.890 W/kg; SAR(10 g) = 0.462 W/kg

Maximum value of SAR (measured) = 1.13 W/kg

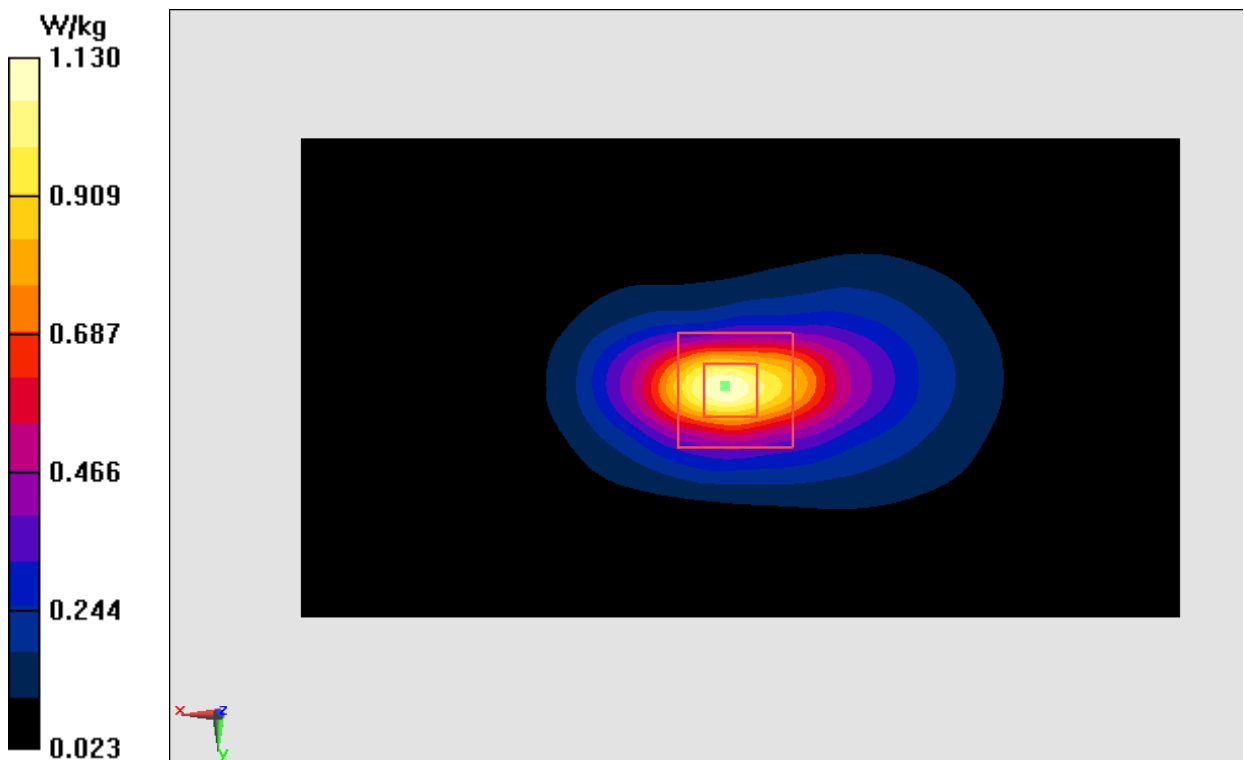


Fig.4 1900 MHz

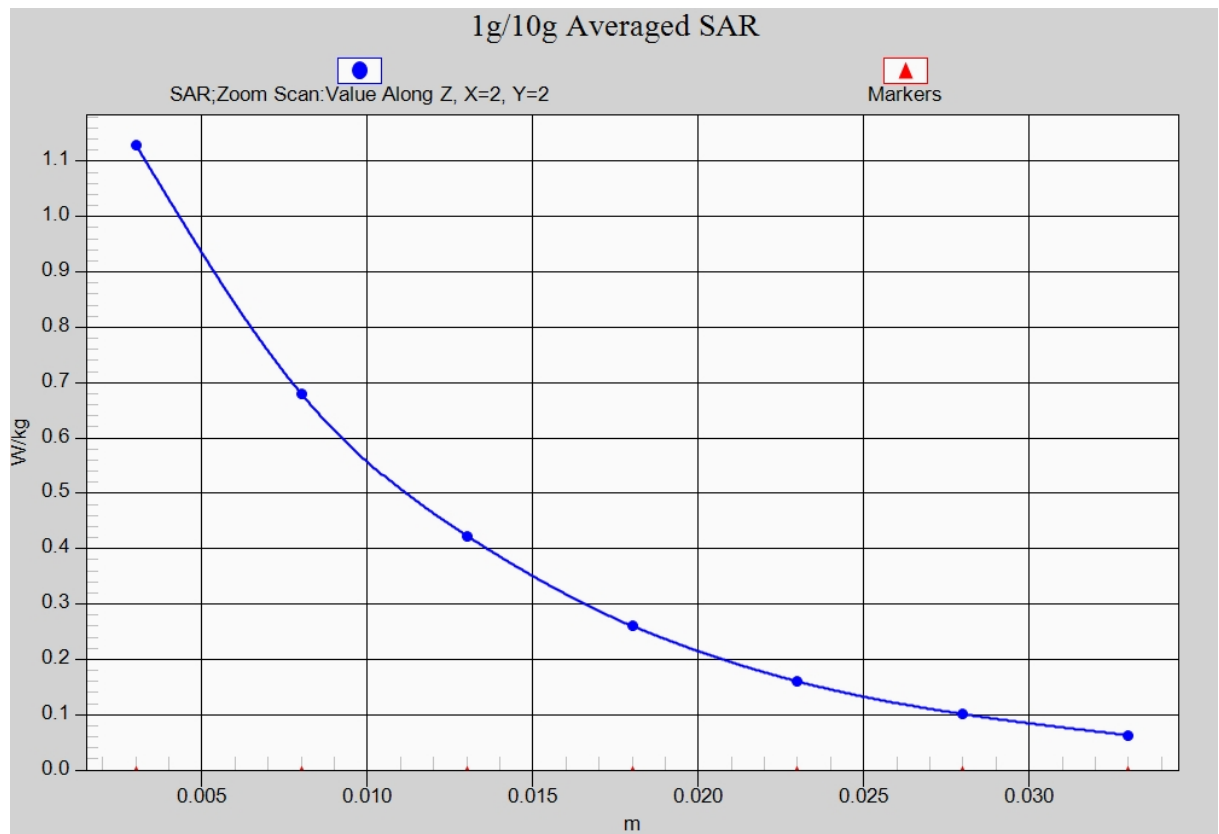


Fig. 4-1Z-Scan at power reference point (1900 MHz)

WCDMA 850 Left Cheek High

Date: 2017-4-13

Electronics: DAE4 Sn1331

Medium: Head 850 MHz

Medium parameters used (interpolated): $f = 846.6$ MHz; $\sigma = 0.914$ mho/m; $\epsilon_r = 41.02$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.9°C Liquid Temperature: 22.5°C

Communication System: WCDMA; Frequency: 846.6 MHz; Duty Cycle: 1:1

Probe: EX3DV4 – SN3846 ConvF(9.33, 9.33, 9.33)

Area Scan (71x121x1): Interpolated grid: $dx=1.000$ mm, $dy=1.000$ mm

Maximum value of SAR (interpolated) = 0.316 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5$ mm, $dy=5$ mm, $dz=5$ mm

Reference Value = 5.678 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 0.361 W/kg

SAR(1 g) = 0.288 W/kg; SAR(10 g) = 0.221 W/kg

Maximum value of SAR (measured) = 0.315 W/kg

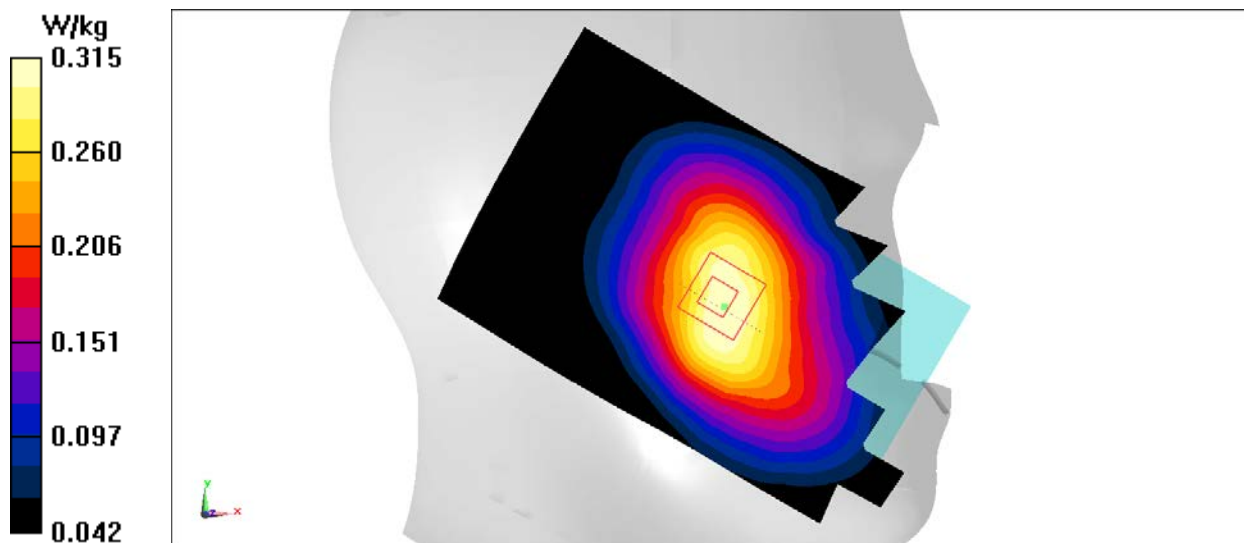


Fig.5 WCDMA 850

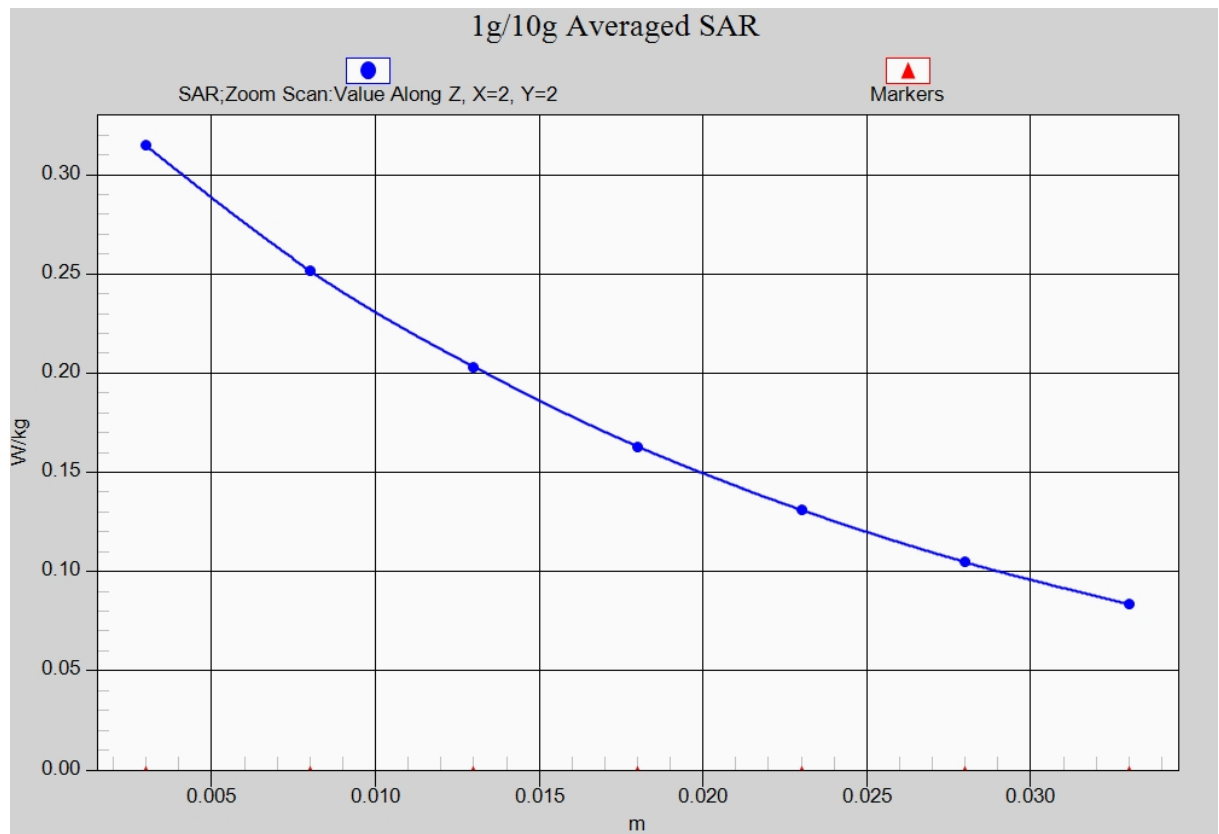


Fig. 5-1Z-Scan at power reference point (850 MHz)

WCDMA 850Body LeftHigh

Date: 2017-4-13

Electronics: DAE4 Sn1331

Medium: Body 850 MHz

Medium parameters used (interpolated): $f = 846.6$ MHz; $\sigma = 1.002$ mho/m; $\epsilon_r = 55.32$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.9°C Liquid Temperature: 22.5°C

Communication System: WCDMA; Frequency: 846.6 MHz; Duty Cycle: 1:1

Probe: EX3DV4 – SN3846ConvF(9.52, 9.52, 9.52)

Area Scan (111x61x1): Interpolated grid: $dx=1.000$ mm, $dy=1.000$ mm

Maximum value of SAR (interpolated) = 0.439 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5$ mm, $dy=5$ mm, $dz=5$ mm

Reference Value = 20.15 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 0.537 W/kg

SAR(1 g) = 0.383 W/kg; SAR(10 g) = 0.266 W/kg

Maximum value of SAR (measured) = 0.436 W/kg

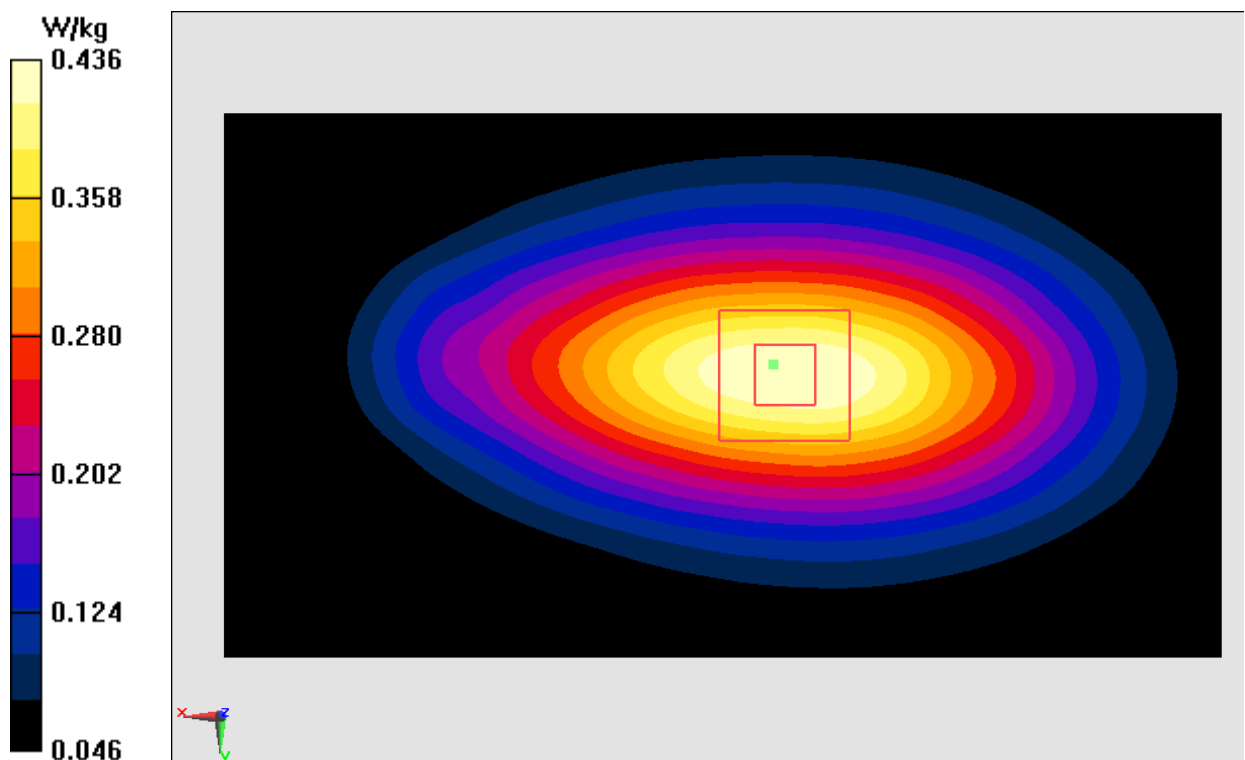


Fig.6 WCDMA 850

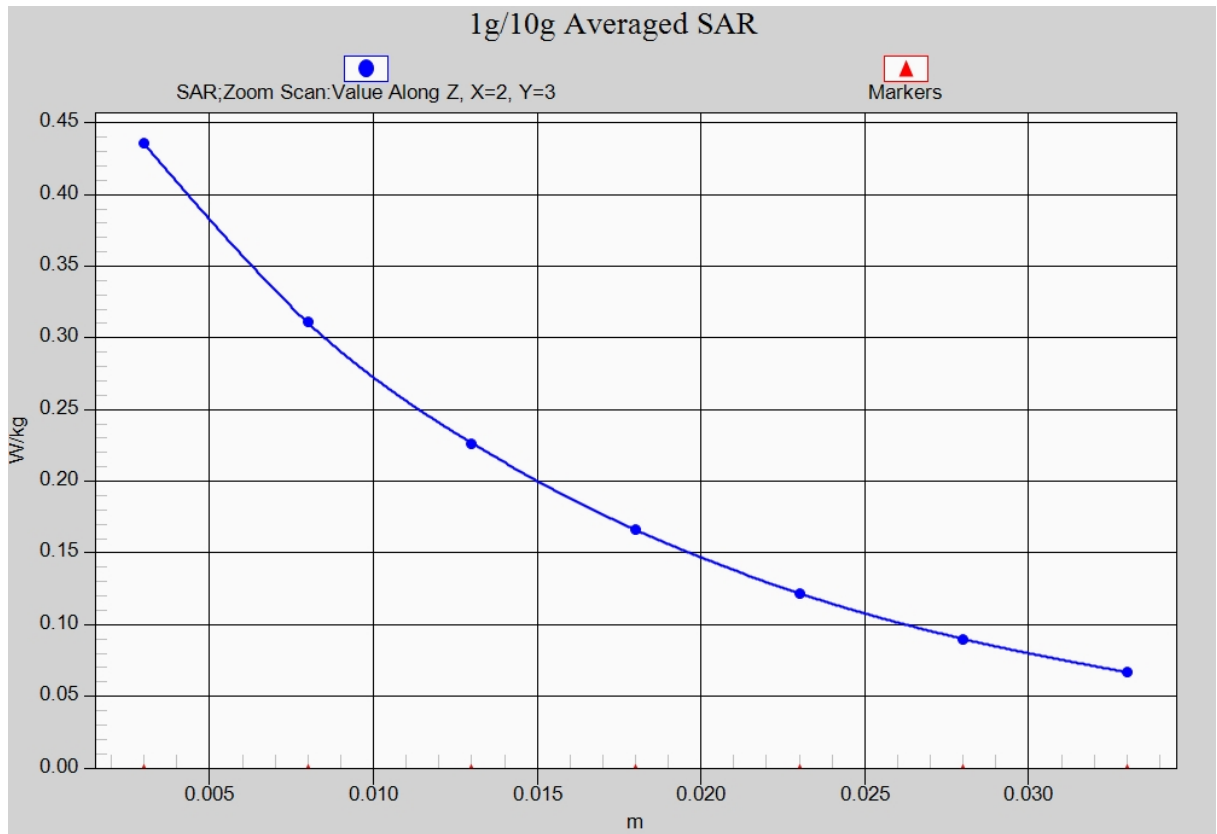


Fig. 6-1 Z-Scan at power reference point (WCDMA850)

WCDMA 1700Left Cheek High

Date: 2017-4-14

Electronics: DAE4 Sn1331

Medium: Head 1750 MHz

Medium parameters used (interpolated): $f = 1752.6$ MHz; $\sigma = 1.382$ mho/m; $\epsilon_r = 40.62$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.9°C Liquid Temperature: 22.5°C

Communication System: WCDMA 1750 Frequency: 1752.6 MHz Duty Cycle: 1:1

Probe: EX3DV4– SN3846 ConvF(8.16, 8.16, 8.16)

Area Scan (71x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.252 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 5.403 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 0.279 W/kg

SAR(1 g) = 0.191 W/kg; SAR(10 g) = 0.124 W/kg

Maximum value of SAR (measured) = 0.222 W/kg

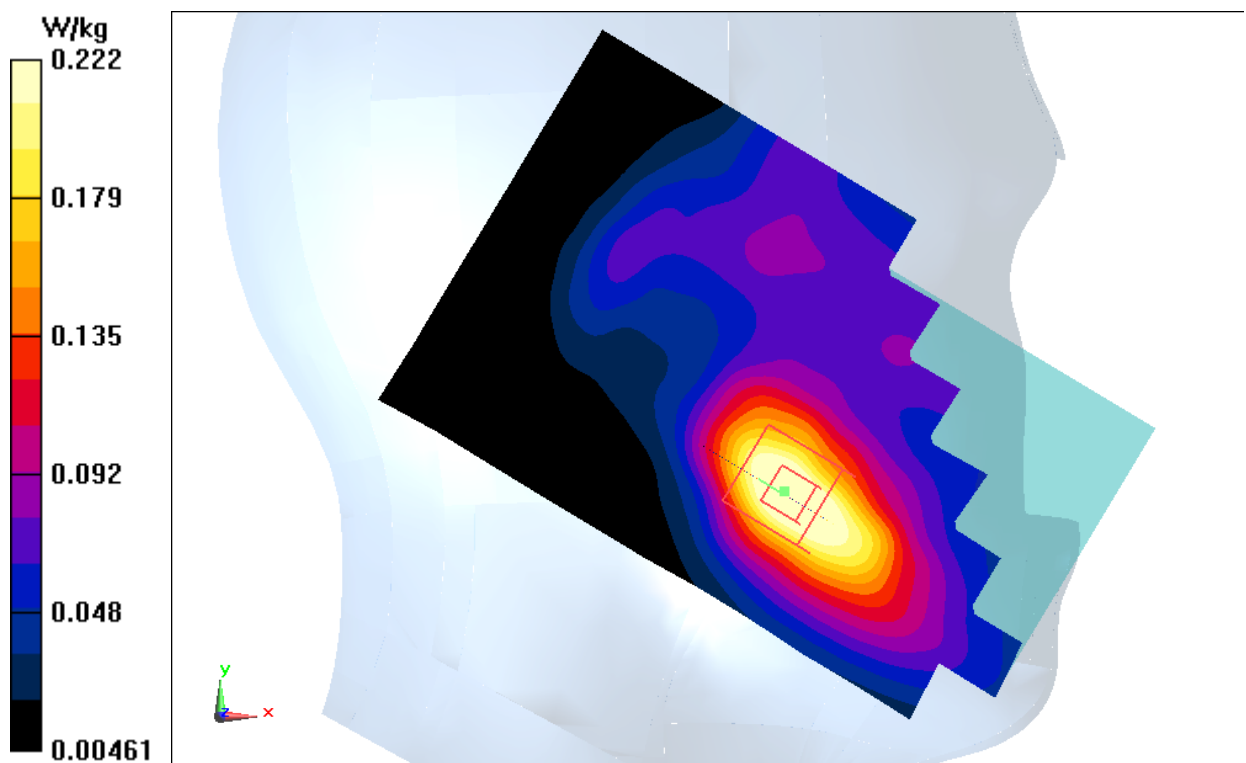


Fig.7WCDMA1700

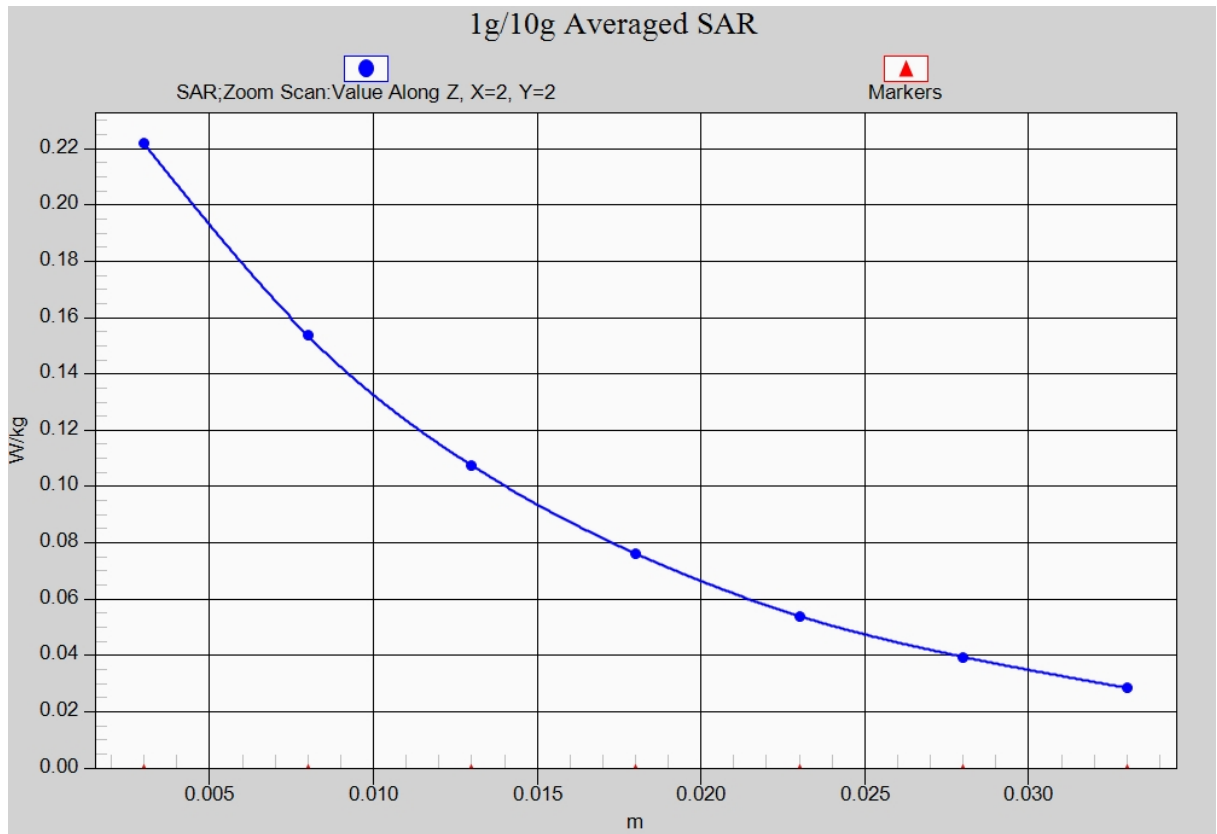


Fig. 7-1 Z-Scan at power reference point (WCDMA1700)

WCDMA 1700 Body BottomHigh

Date: 2017-4-14

Electronics: DAE4 Sn1331

Medium: Body 1750 MHz

Medium parameters used: $f = 1752.6$ MHz; $\sigma = 1.516$ mho/m; $\epsilon_r = 53.14$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.9°C Liquid Temperature: 22.5°C

Communication System: WCDMA 1900 Frequency: 1752.6 MHz Duty Cycle: 1:1

Probe: EX3DV4- SN3846 ConvF(7.90, 7.90, 7.90)

Area Scan (111x61x1): Interpolated grid: $dx=1.000$ mm, $dy=1.000$ mm

Maximum value of SAR (interpolated) = 1.43 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5$ mm, $dy=5$ mm, $dz=5$ mm

Reference Value = 19.17 V/m; Power Drift = -0.07 dB

Peak SAR (extrapolated) = 1.97 W/kg

SAR(1 g) = 1.13 W/kg; SAR(10 g) = 0.586 W/kg

Maximum value of SAR (measured) = 1.44 W/kg

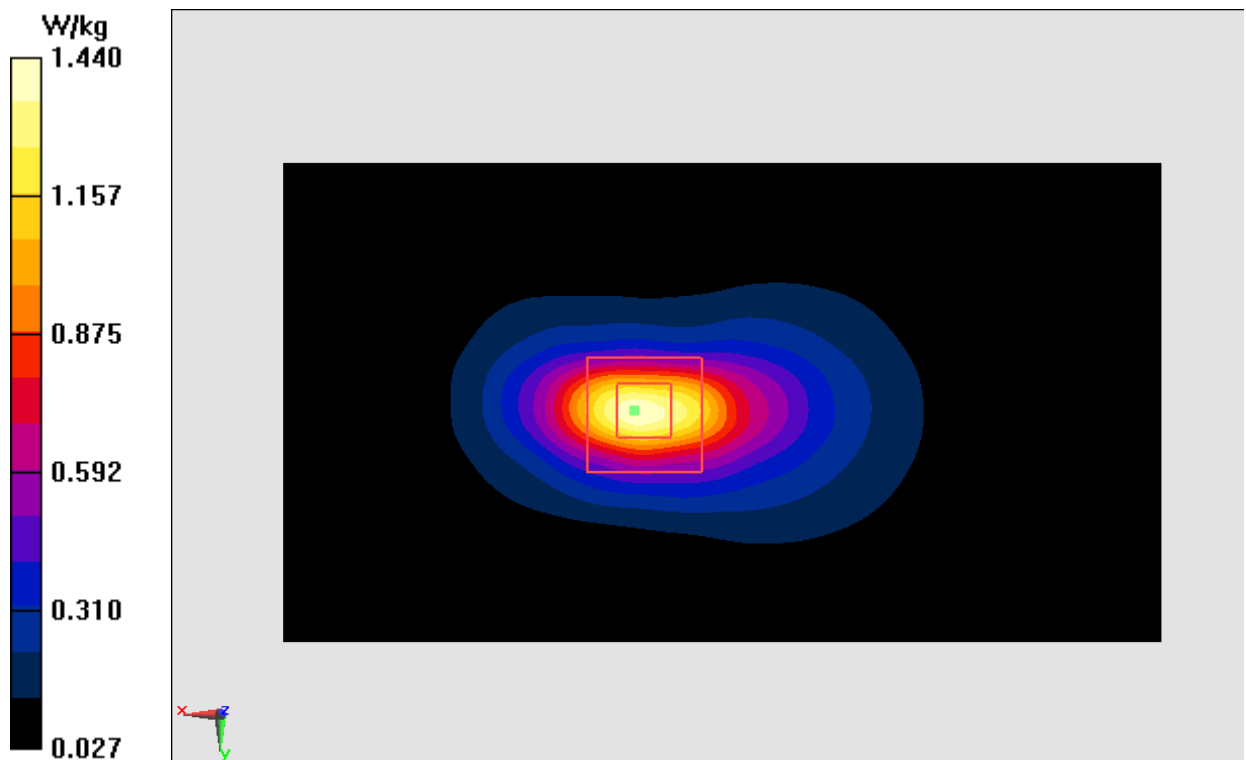


Fig.8WCDMA1700

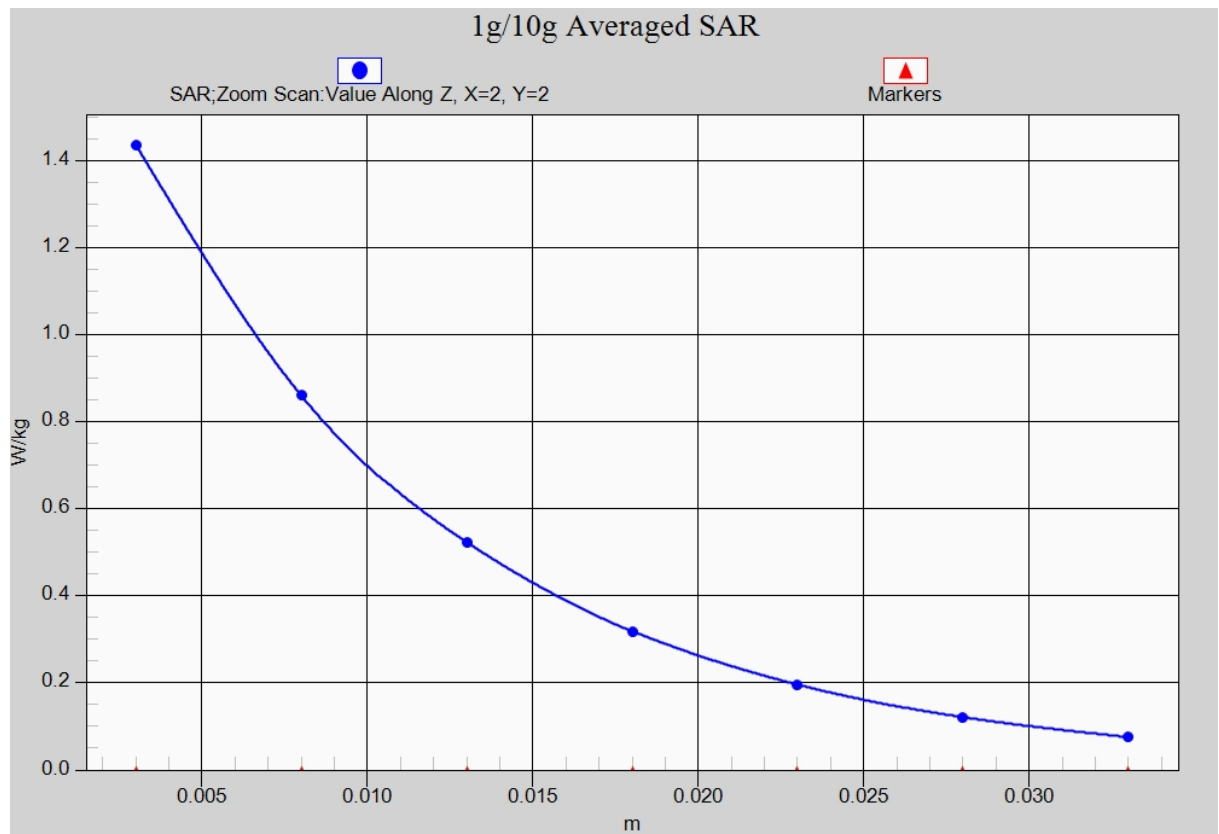


Fig. 8-1 Z-Scan at power reference point (WCDMA1700)

WCDMA 1900 Right Cheek Low

Date: 2017-4-15

Electronics: DAE4 Sn1331

Medium: Head 1900 MHz

Medium parameters used (interpolated): $f = 1852.4$ MHz; $\sigma = 1.355$ mho/m; $\epsilon_r = 40.54$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.9°C Liquid Temperature: 22.5°C

Communication System: WCDMA 1900 Frequency: 1852.4 MHz Duty Cycle: 1:1

Probe: EX3DV4- SN3846 ConvF(7.89, 7.89, 7.89)

Area Scan (71x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.214 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 5.993 V/m; Power Drift = 0.08 dB

Peak SAR (extrapolated) = 0.251 W/kg

SAR(1 g) = 0.173 W/kg; SAR(10 g) = 0.114 W/kg

Maximum value of SAR (measured) = 0.201 W/kg

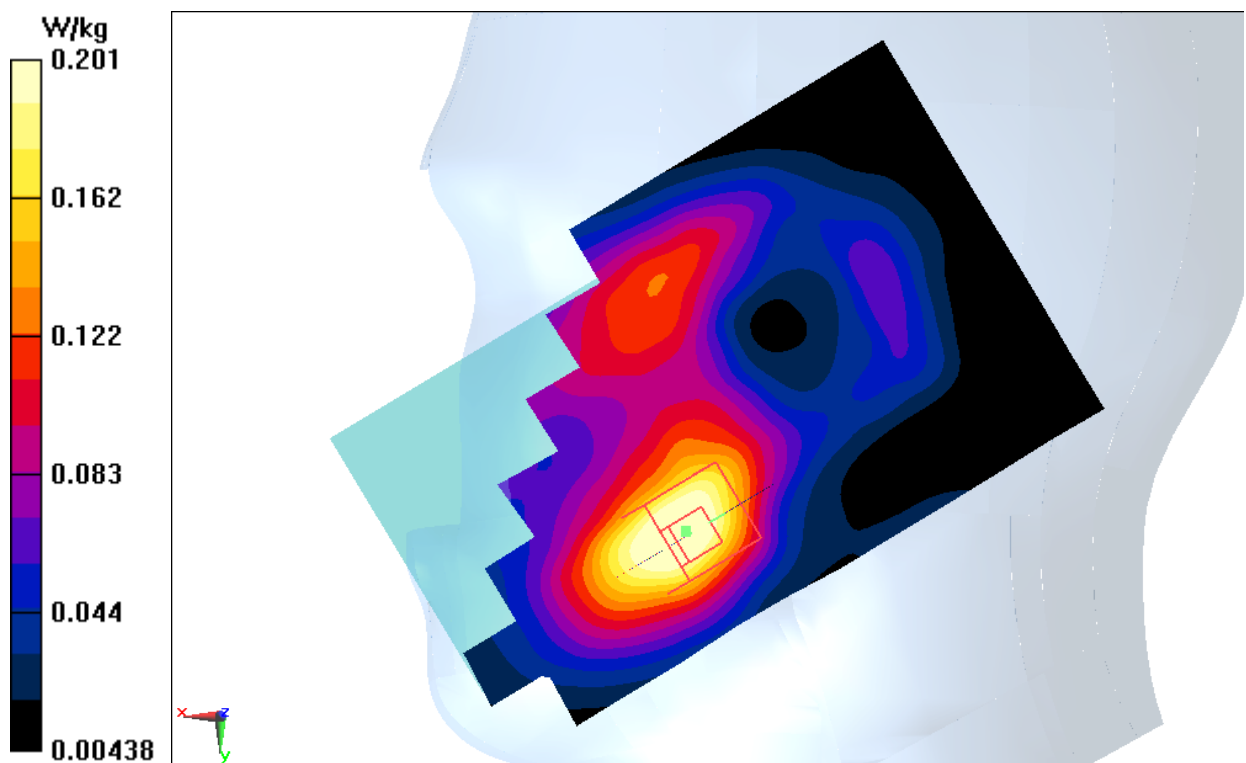


Fig.9WCDMA1900

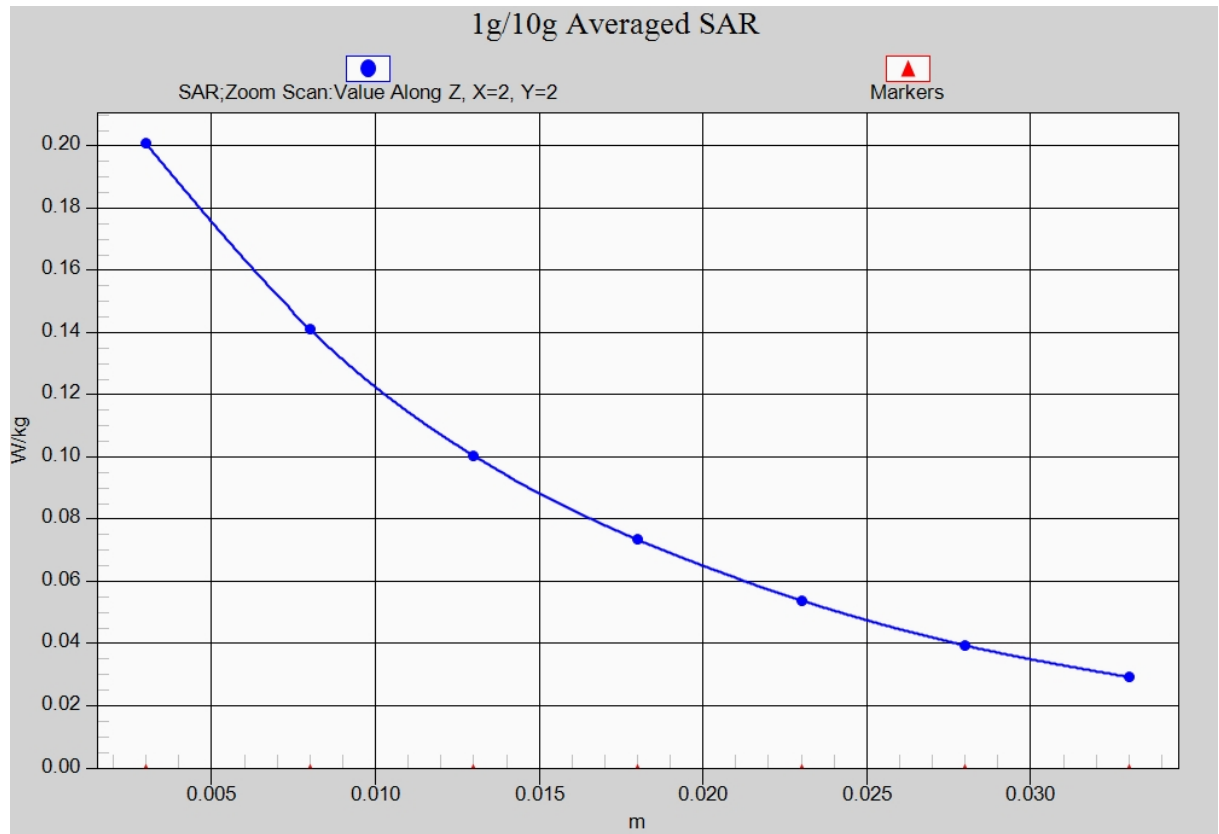


Fig. 9-1 Z-Scan at power reference point (WCDMA1900)

WCDMA 1900 Body BottomHigh

Date: 2017-4-15

Electronics: DAE4 Sn1331

Medium: Body 1900 MHz

Medium parameters used (interpolated): $f = 1907.6$ MHz; $\sigma = 1.542$ mho/m; $\epsilon_r = 52.98$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.9°C Liquid Temperature: 22.5°C

Communication System: WCDMA 1900 Frequency: 1907.6 MHz Duty Cycle: 1:1

Probe: EX3DV4– SN3846 ConvF(7.57, 7.57, 7.57)

Area Scan (111x61x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 1.65 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 29.95 V/m; Power Drift = -0.09 dB

Peak SAR (extrapolated) = 2.29 W/kg

SAR(1 g) = 1.31 W/kg; SAR(10 g) = 0.675 W/kg

Maximum value of SAR (measured) = 1.62 W/kg

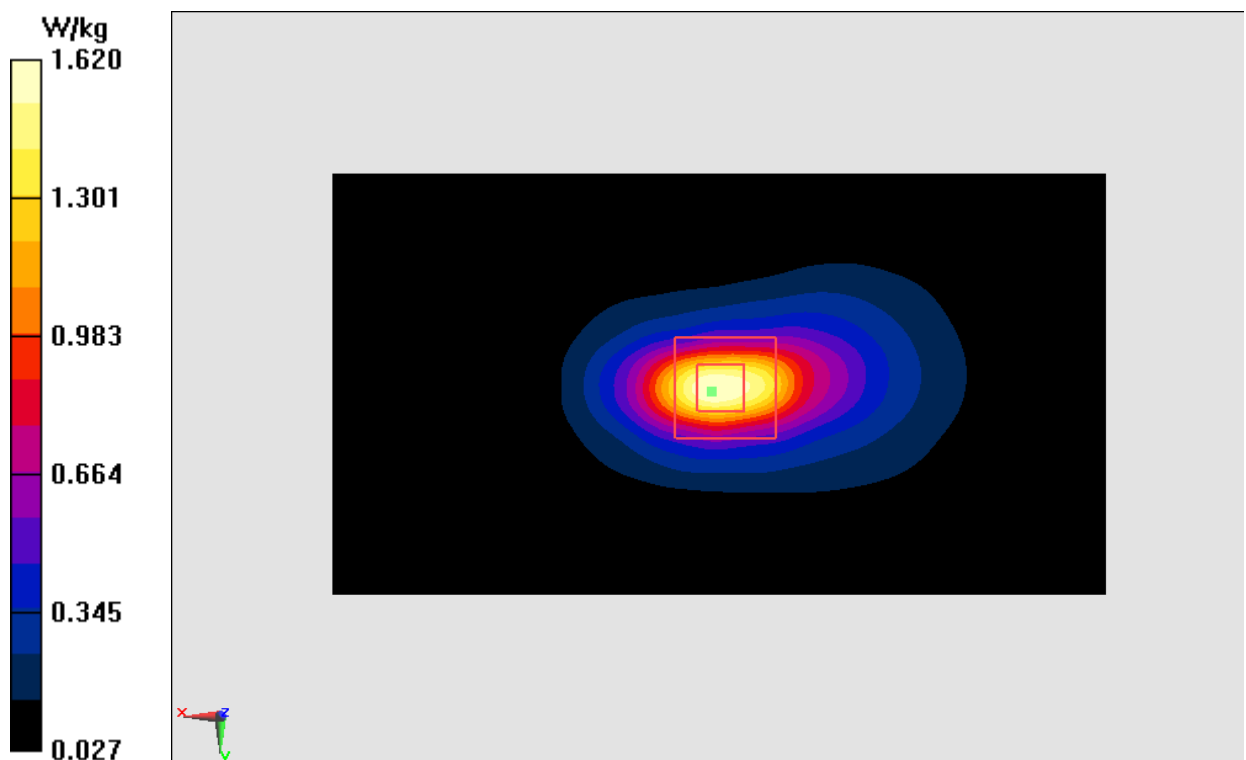


Fig.10WCDMA1900

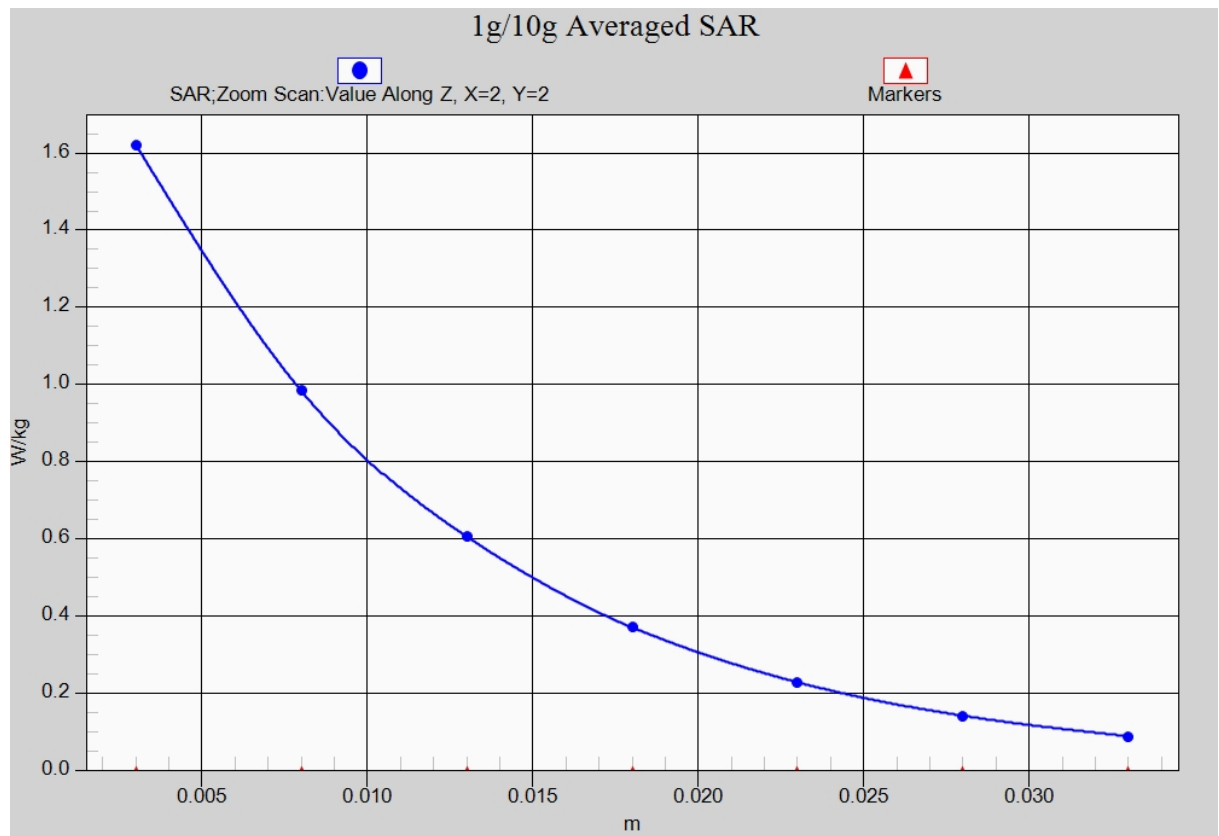


Fig. 10-1 Z-Scan at power reference point (WCDMA1900)

LTE Band2Left Cheek High with QPSK_20M_1RB_Low

Date: 2017-4-15

Electronics: DAE4 Sn1331

Medium: Head 1900 MHz

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.390$ mho/m; $\epsilon_r = 39.55$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.9°C Liquid Temperature: 22.5°C

Communication System: LTE Band2Frequency: 1900 MHz Duty Cycle: 1:1

Probe: EX3DV4- SN3846 ConvF(7.89, 7.89, 7.89)

Area Scan (71x121x1): Interpolated grid: $dx=1.000$ mm, $dy=1.000$ mm

Maximum value of SAR (interpolated) = 0.219 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5$ mm, $dy=5$ mm, $dz=5$ mm

Reference Value = 3.777 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 0.289 W/kg

SAR(1 g) = 0.187 W/kg; SAR(10 g) = 0.116 W/kg

Maximum value of SAR (measured) = 0.224 W/kg

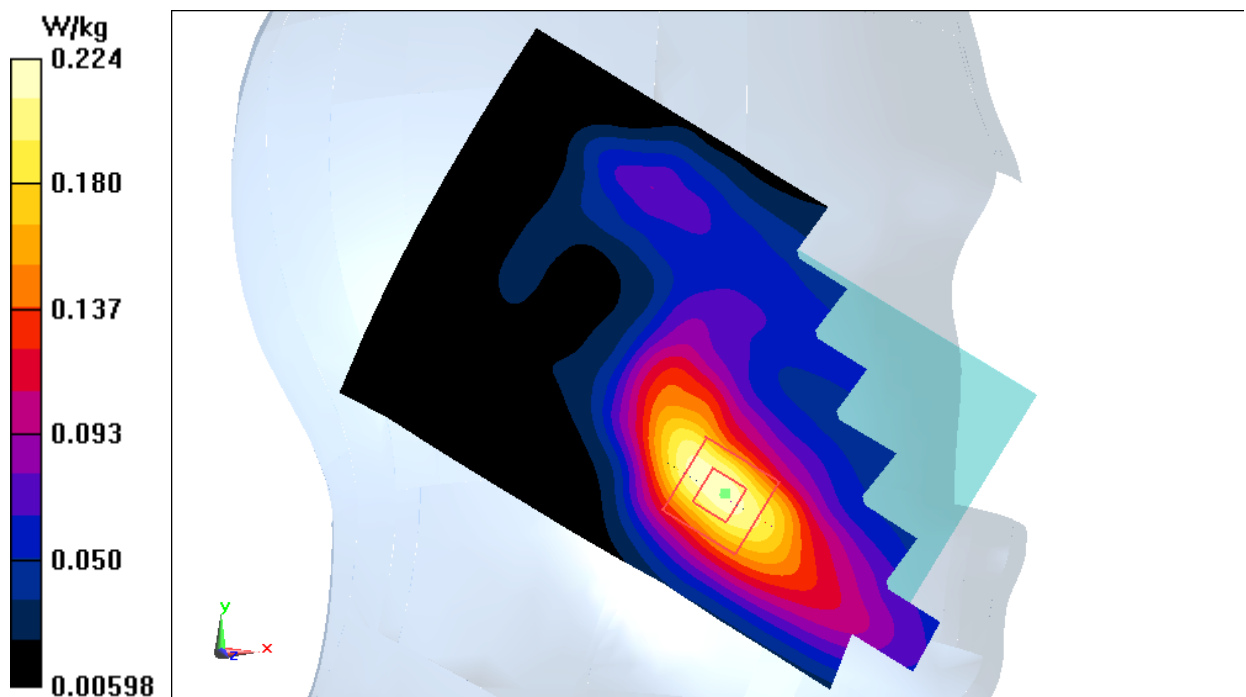


Fig.11 LTE Band2

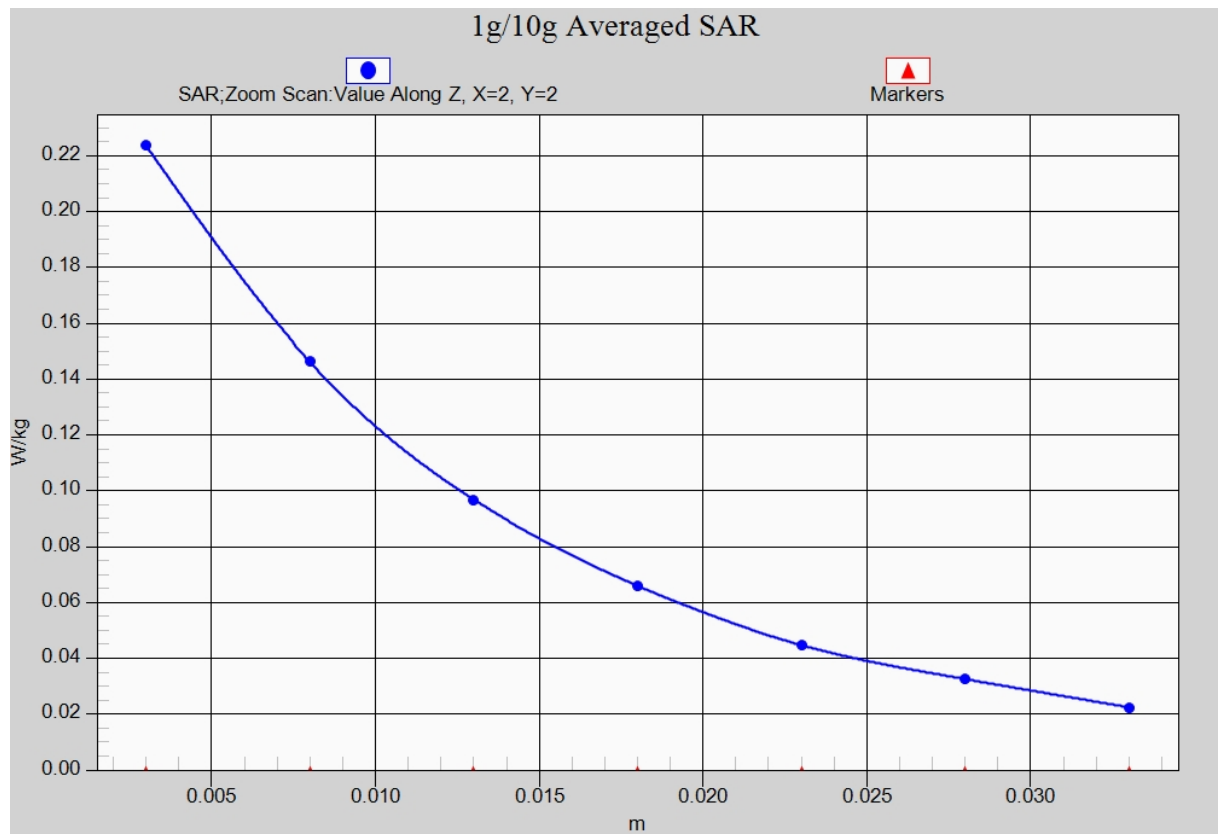


Fig. 11-1 Z-Scan at power reference point (LTE Band2)

LTE Band2Body BottomHigh with QPSK_20M_1RB_Low

Date: 2017-4-15

Electronics: DAE4 Sn1331

Medium: Body 1900 MHz

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.536$ mho/m; $\epsilon_r = 53.19$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.9°C Liquid Temperature: 22.5°C

Communication System: LTE Band2 Frequency: 1900 MHz Duty Cycle: 1:1

Probe: EX3DV4- SN3846 ConvF(7.57, 7.57, 7.57)

Area Scan (111x61x1): Interpolated grid: $dx=1.000$ mm, $dy=1.000$ mm

Maximum value of SAR (interpolated) = 1.30 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5$ mm, $dy=5$ mm, $dz=5$ mm

Reference Value = 27.86 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 1.83 W/kg

SAR(1 g) = 1.05 W/kg; SAR(10 g) = 0.536 W/kg

Maximum value of SAR (measured) = 1.29 W/kg

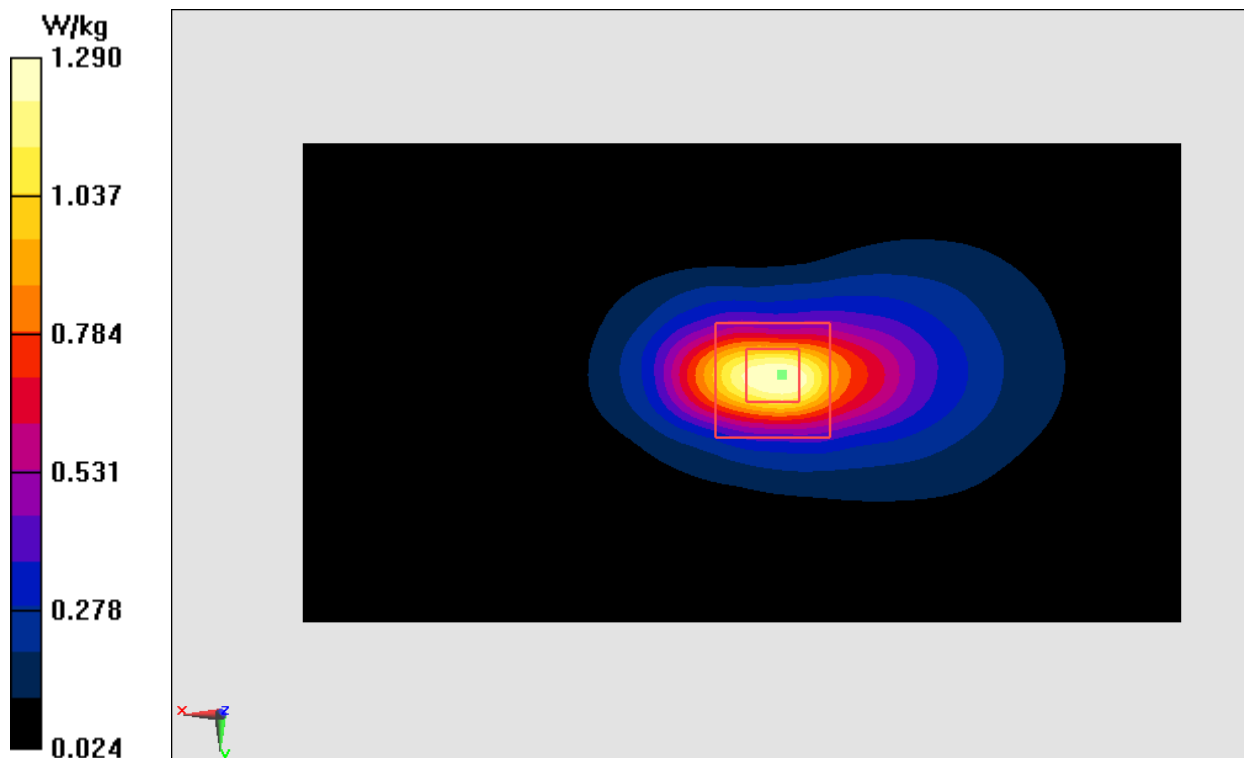


Fig.12 LTE Band2

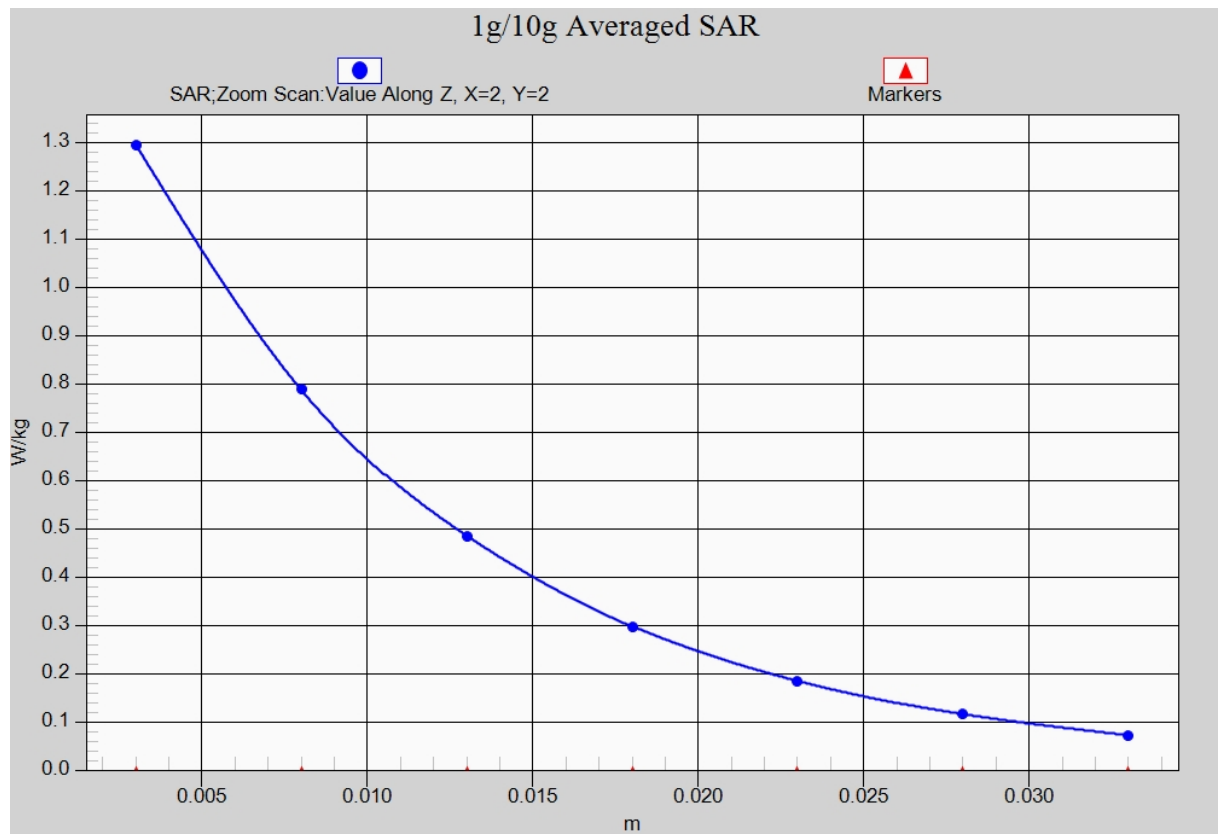


Fig. 12-1 Z-Scan at power reference point (LTE Band2)

LTE Band4Left Cheek High with QPSK_20M_1RB_High

Date: 2017-4-14

Electronics: DAE4 Sn1331

Medium: Head 1750 MHz

Medium parameters used $f = 1745$ MHz; $\sigma = 1.376$ mho/m; $\epsilon_r = 40.80$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.9°C Liquid Temperature: 22.5°C

Communication System: LTE Band4 Frequency: 1745MHz Duty Cycle: 1:1

Probe: EX3DV4 – SN3846ConvF(8.16, 8.16, 8.16)

Area Scan (71x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.276 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 5.649 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 0.333 W/kg

SAR(1 g) = 0.229 W/kg; SAR(10 g) = 0.148 W/kg

Maximum value of SAR (measured) = 0.262 W/kg

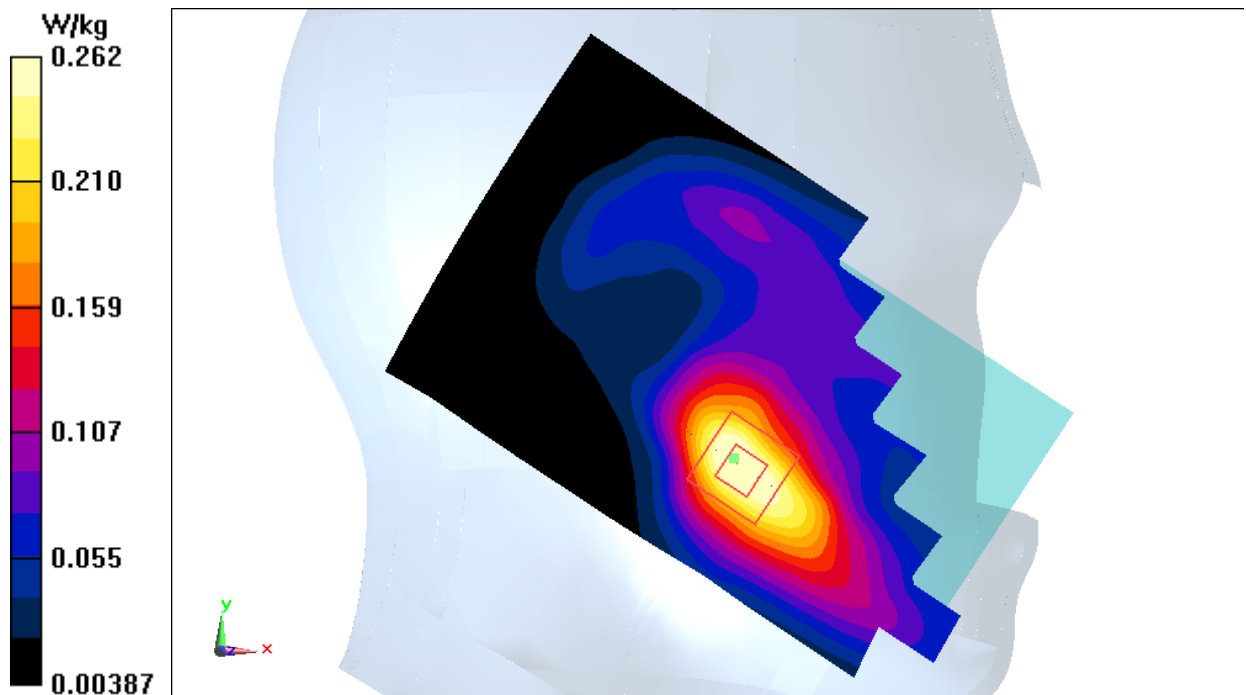


Fig.13 LTE Band4

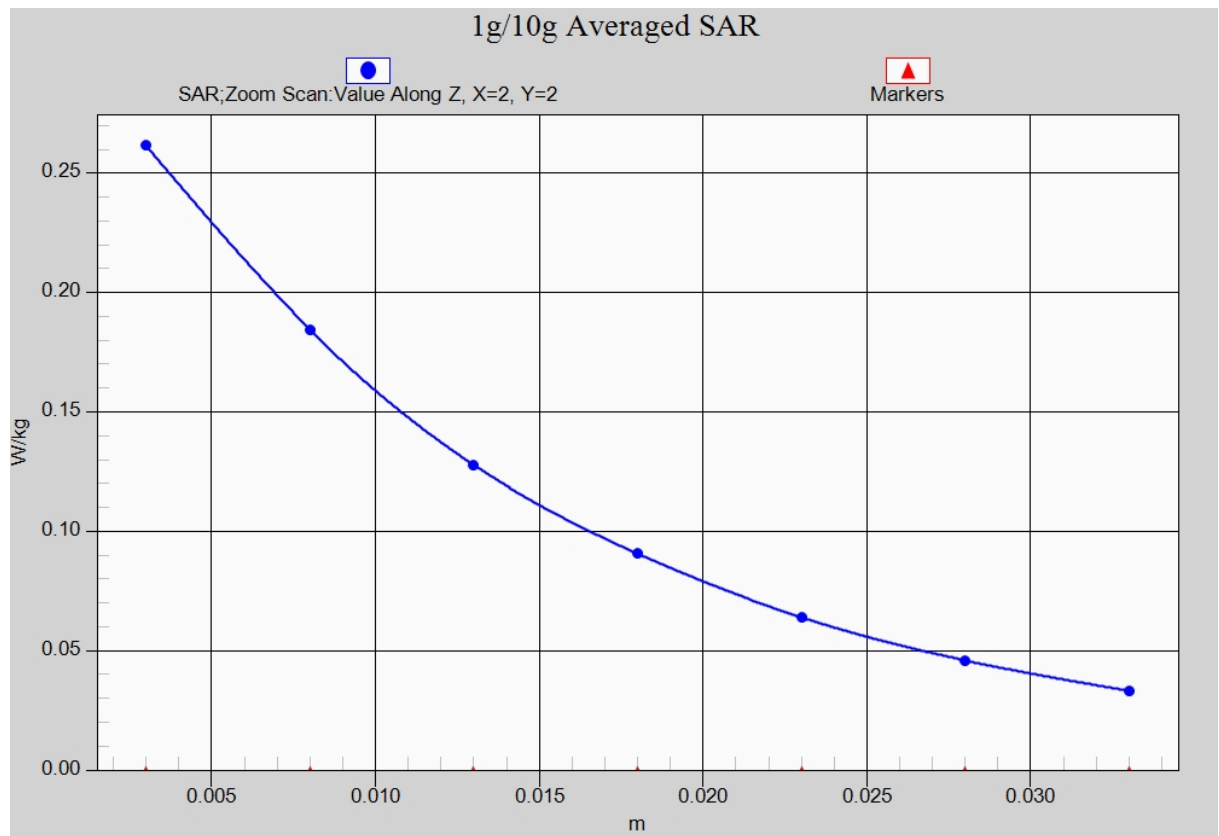


Fig. 13-1 Z-Scan at power reference point (LTE Band4)

LTE Band4Body Bottom High with QPSK_20M_1RB_High

Date: 2017-4-14

Electronics: DAE4 Sn1331

Medium: Body 1750 MHz

Medium parameters used: $f = 1745$ MHz; $\sigma = 1.510$ mho/m; $\epsilon_r = 53.37$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.9°C Liquid Temperature: 22.5°C

Communication System: LTE Band4 Frequency: 1745 MHz Duty Cycle: 1:1

Probe: EX3DV4 – SN3846ConvF(7.90, 7.90, 7.90)

Area Scan (111x61x1): Interpolated grid: $dx=1.000$ mm, $dy=1.000$ mm

Maximum value of SAR (interpolated) = 1.48 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5$ mm, $dy=5$ mm, $dz=5$ mm

Reference Value = 24.71 V/m; Power Drift = -0.09 dB

Peak SAR (extrapolated) = 2.01 W/kg

SAR(1 g) = 1.15 W/kg; SAR(10 g) = 0.589 W/kg

Maximum value of SAR (measured) = 1.46 W/kg

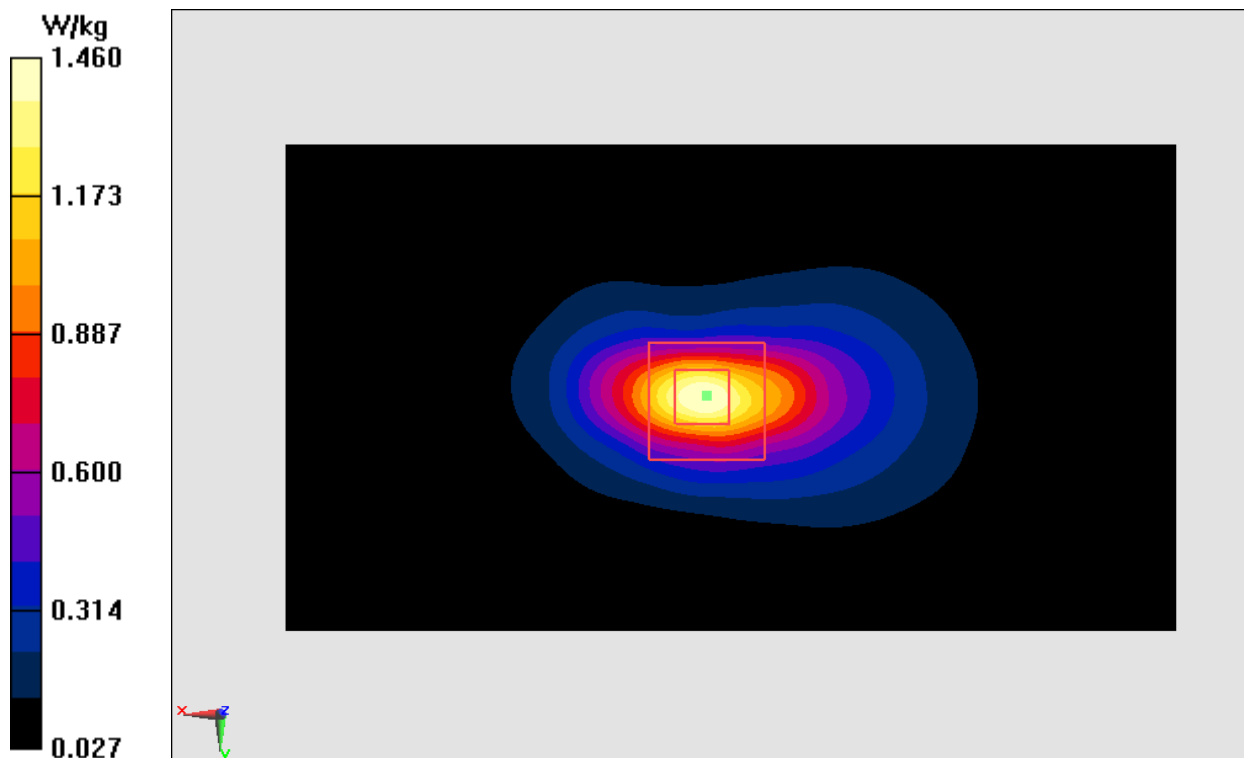


Fig.14 LTE Band4

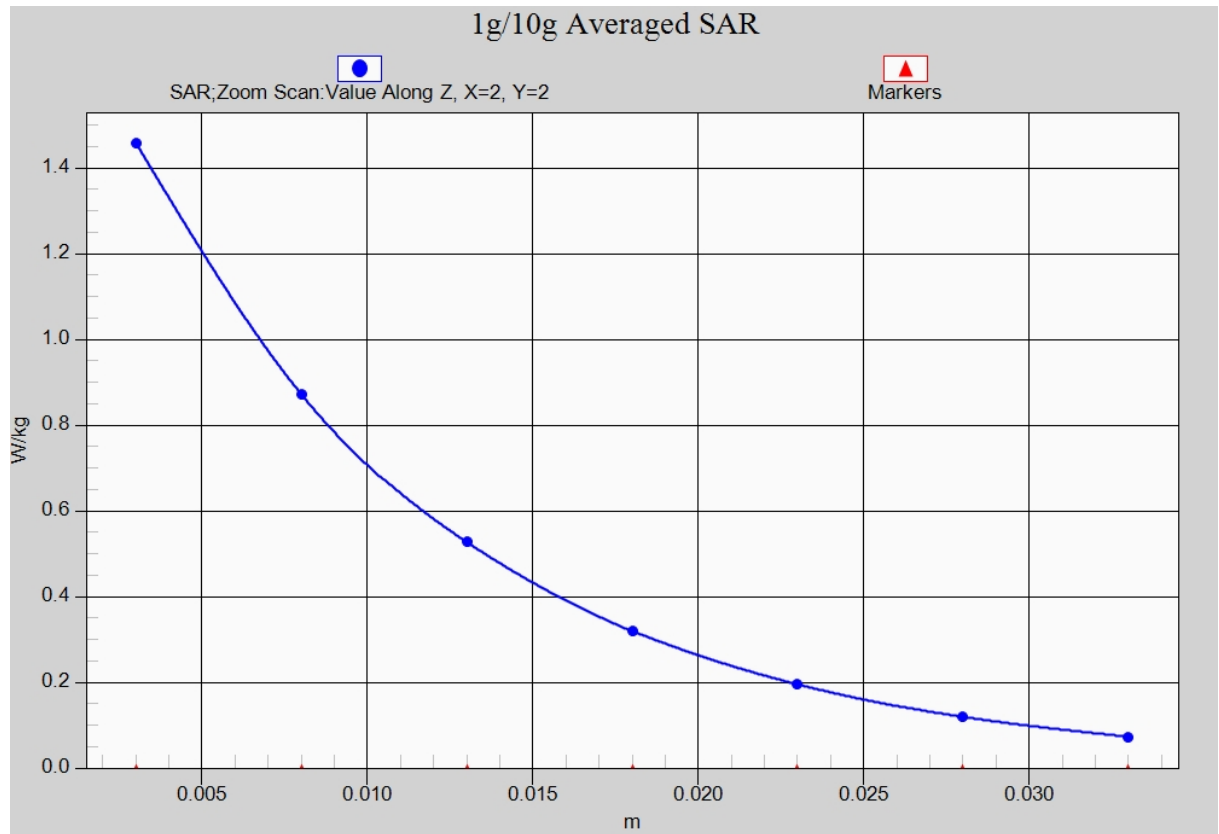


Fig. 14-1 Z-Scan at power reference point (LTE Band4)

LTE Band5 Left Cheek High with QPSK_10M_1RB_High

Date: 2017-4-13

Electronics: DAE4 Sn1331

Medium: Head 850 MHz

Medium parameters used (interpolated): $f = 844$ MHz; $\sigma = 0.911$ mho/m; $\epsilon_r = 41.15$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.9°C Liquid Temperature: 22.5°C

Communication System: LTE Band5 Frequency: 844 MHz Duty Cycle: 1:1

Probe: EX3DV4 – SN3846 ConvF(9.33, 9.33, 9.33)

Area Scan (71x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.329 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 6.059 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 0.371 W/kg

SAR(1 g) = 0.301 W/kg; SAR(10 g) = 0.233 W/kg

Maximum value of SAR (measured) = 0.328 W/kg

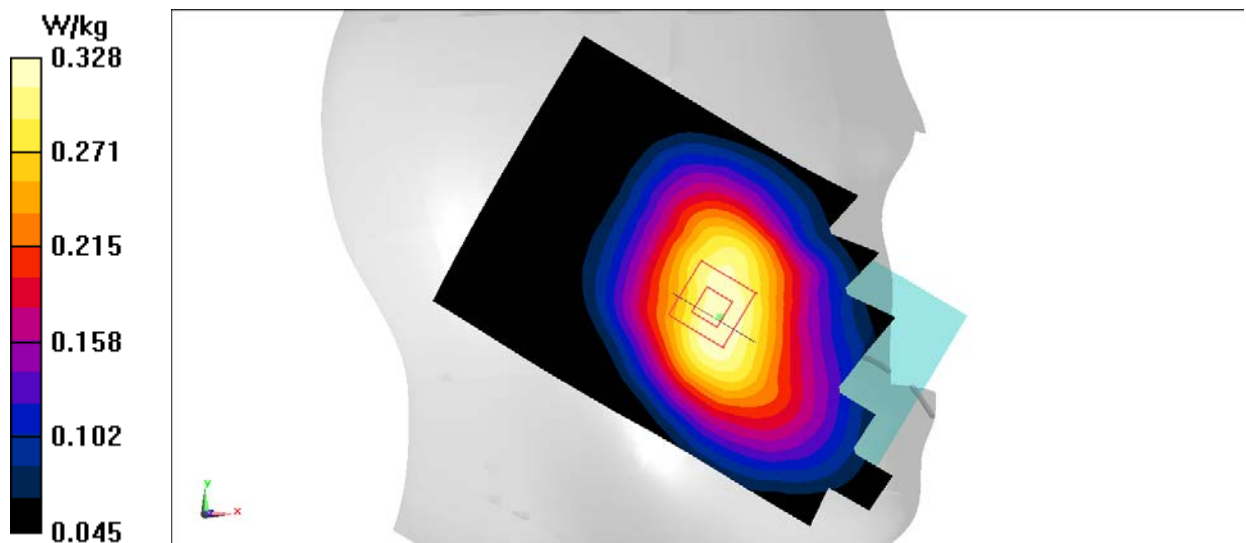


Fig.15 LTE Band5

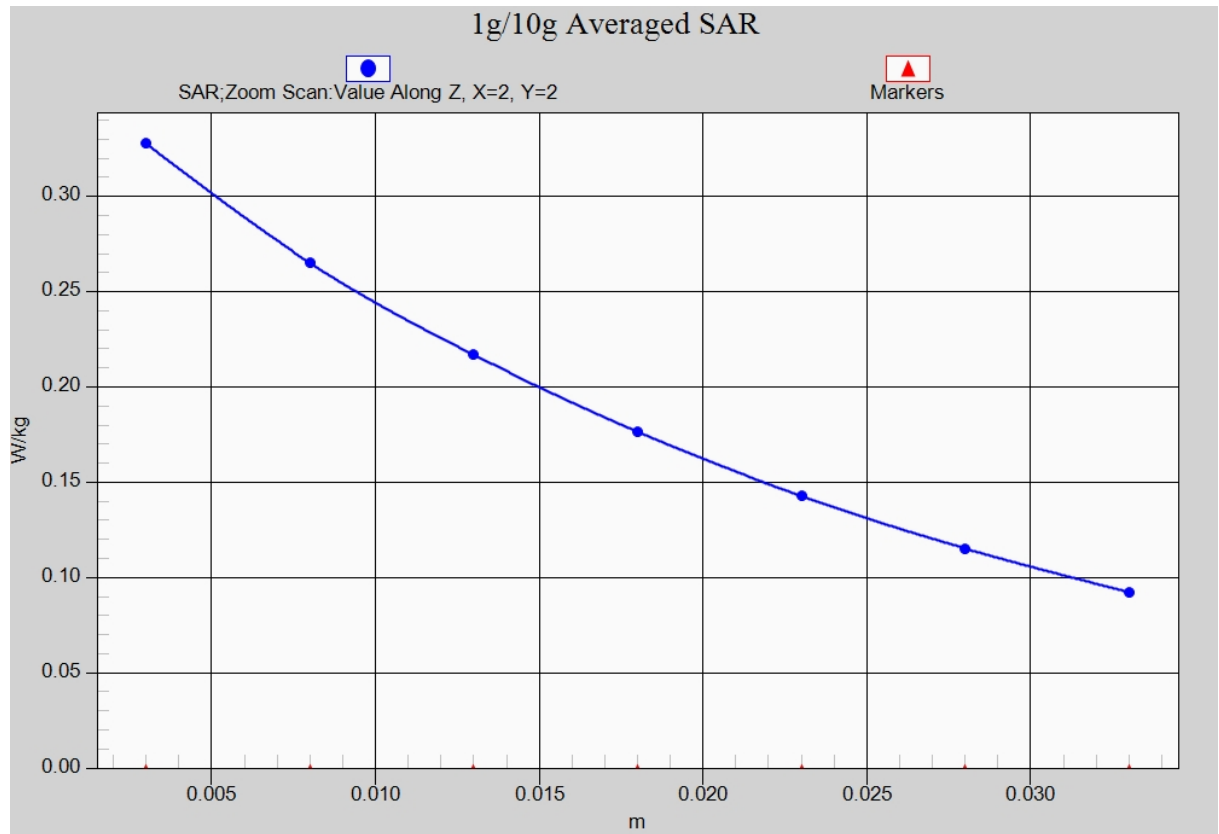


Fig. 15-1 Z-Scan at power reference point (LTE Band5)

LTE Band5 Body LeftHigh with QPSK_10M_1RB_High

Date: 2017-4-13

Electronics: DAE4 Sn1331

Medium: Body 850 MHz

Medium parameters used (interpolated): $f = 844$ MHz; $\sigma = 0.999$ mho/m; $\epsilon_r = 55.50$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.9°C Liquid Temperature: 22.5°C

Communication System: LTE Band5 Frequency: 844 MHz Duty Cycle: 1:1

Probe: EX3DV4 – SN3846 ConvF(9.52, 9.52, 9.52)

Area Scan (111x61x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.472 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 21.50 V/m; Power Drift = -0.08 dB

Peak SAR (extrapolated) = 0.568 W/kg

SAR(1 g) = 0.406 W/kg; SAR(10 g) = 0.281 W/kg

Maximum value of SAR (measured) = 0.462 W/kg

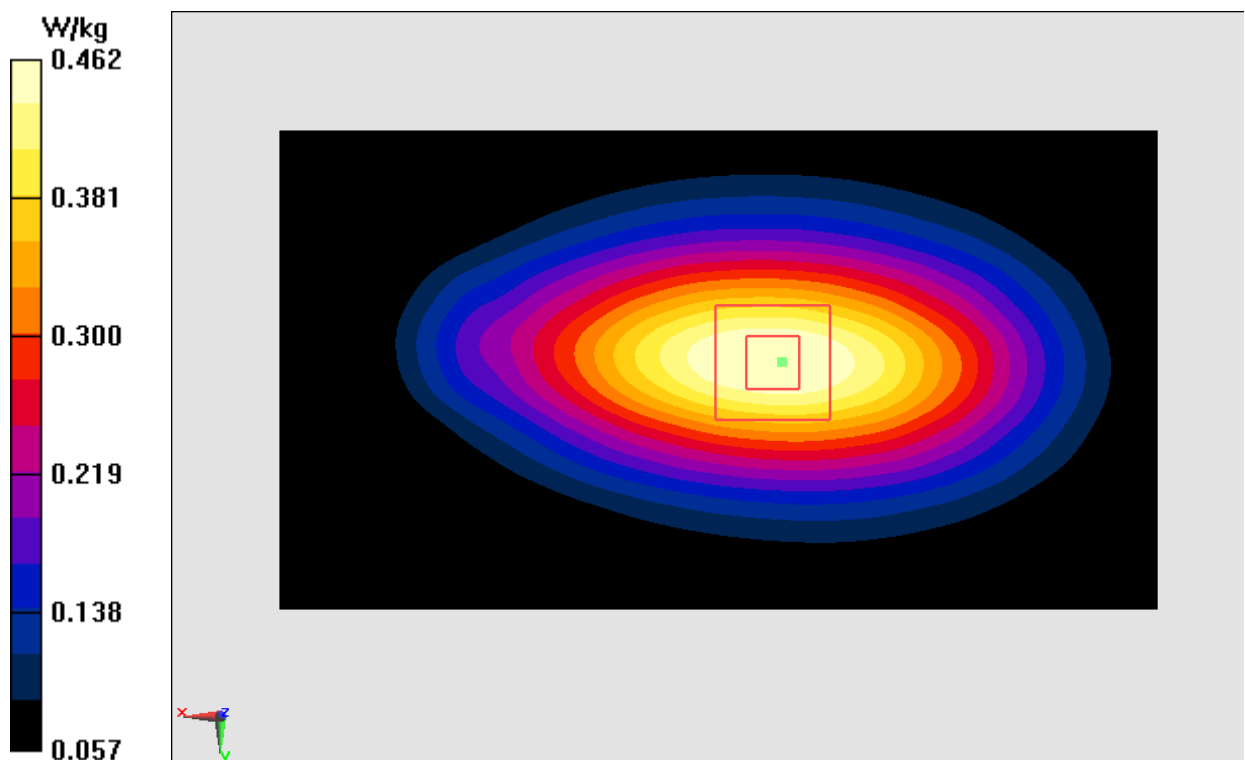


Fig.16 LTE Band5

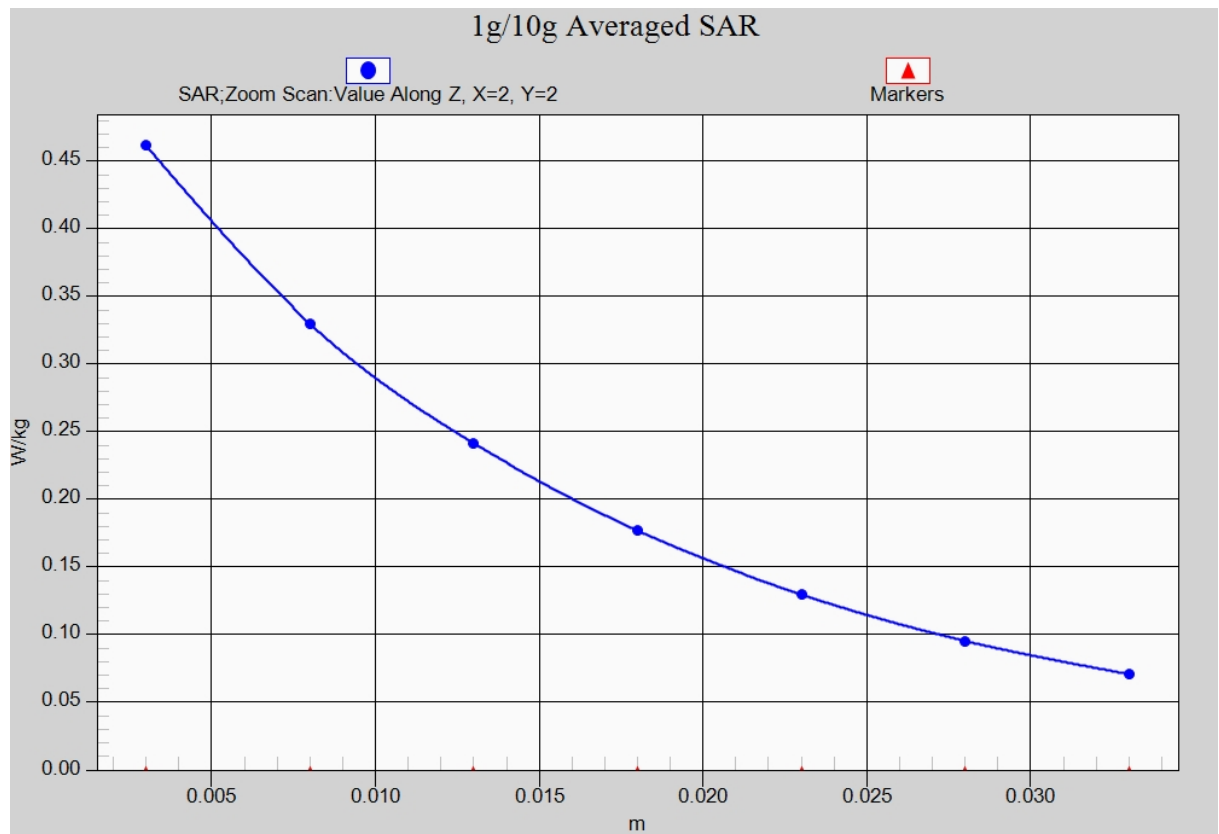


Fig. 16-1 Z-Scan at power reference point (LTE Band5)

LTE Band7Left Cheek High with QPSK_20M_1RB_High

Date: 2017-4-17

Electronics: DAE4 Sn1331

Medium: Head2600 MHz

Medium parameters used: $f = 2560$ MHz; $\sigma = 1.936$ mho/m; $\epsilon_r = 40.18$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.9°C Liquid Temperature: 22.5°C

Communication System: LTE Band7Frequency: 2560 MHz Duty Cycle: 1:1

Probe: EX3DV4– SN3846 ConvF(7.12, 7.12, 7.12)

Area Scan (71x121x1): Interpolated grid: $dx=1.000$ mm, $dy=1.000$ mm

Maximum value of SAR (interpolated) = 0.0164 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5$ mm, $dy=5$ mm, $dz=5$ mm

Reference Value = 0.6740 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 0.0300 W/kg

SAR(1 g) = 0.015 W/kg; SAR(10 g) = 0.00954 W/kg

Maximum value of SAR (measured) = 0.0184 W/kg

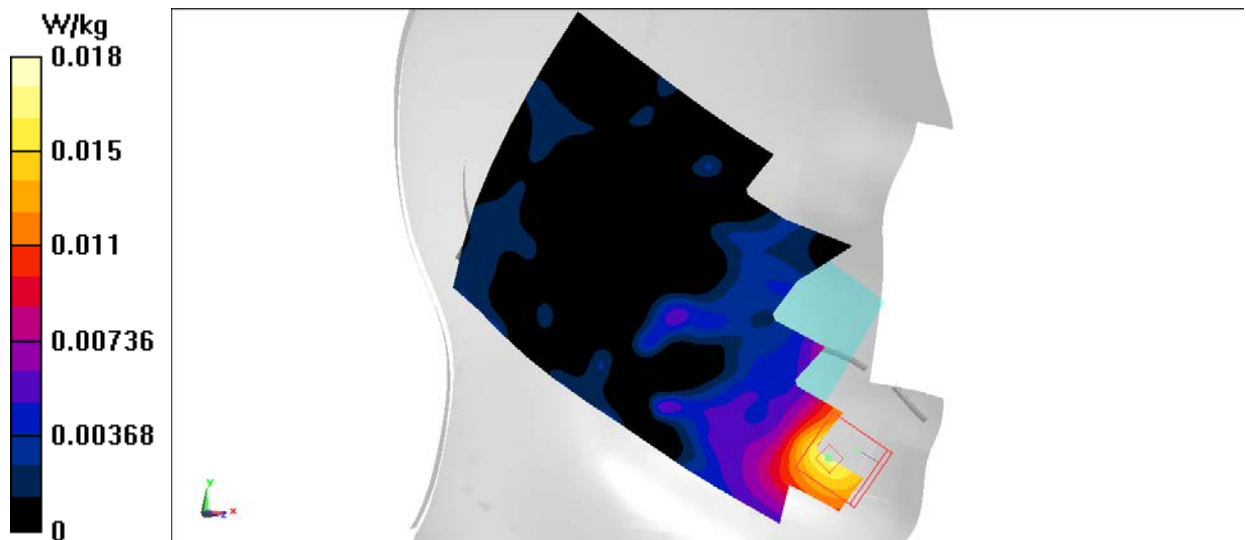


Fig.17 LTE Band7

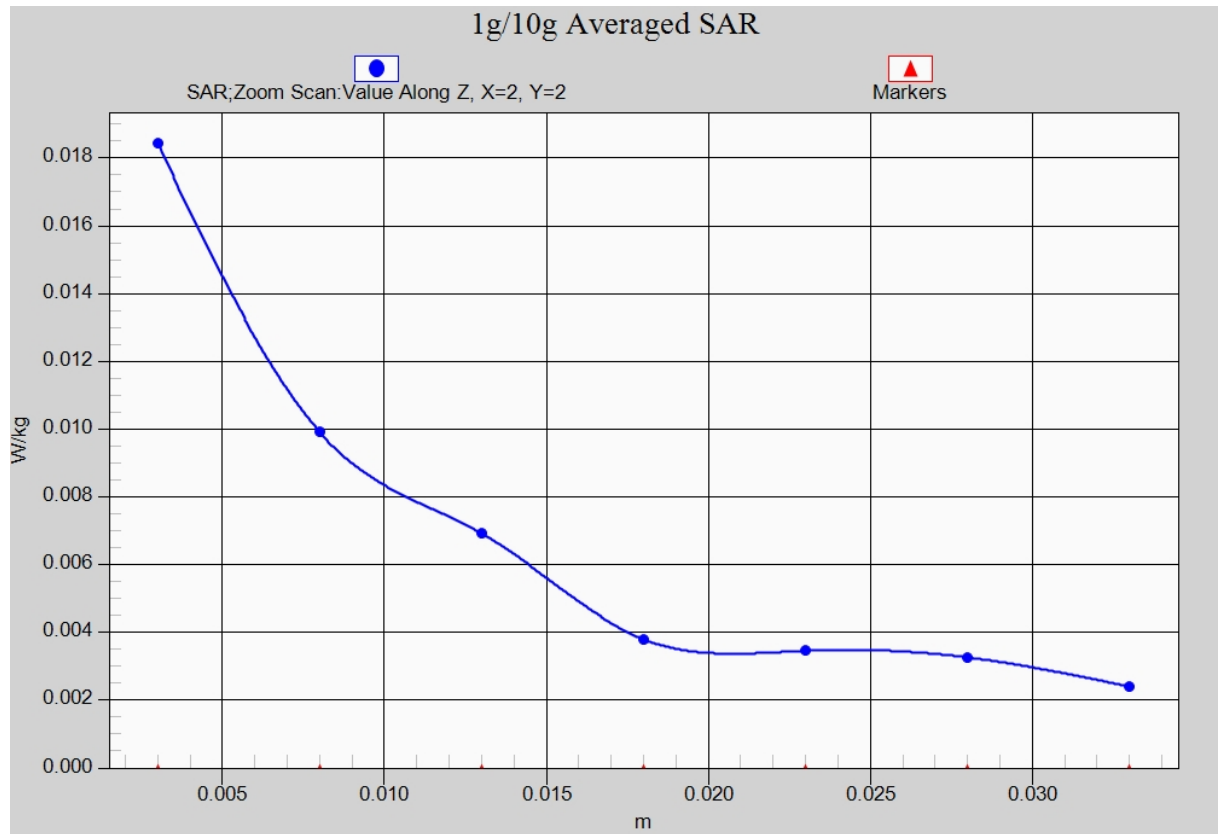


Fig. 17-1 Z-Scan at power reference point (LTE Band7)

LTE Band7Body BottomHigh with QPSK_20M_1RB_High

Date: 2017-4-17

Electronics: DAE4 Sn1331

Medium: Body2600 MHz

Medium parameters used: $f = 2560$ MHz; $\sigma = 2.105$ mho/m; $\epsilon_r = 52.40$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.9°C Liquid Temperature: 22.5°C

Communication System: LTE Band7 Frequency: 2560 MHz Duty Cycle: 1:1

Probe: EX3DV4- SN3846 ConvF(7.25, 7.25, 7.25)

Area Scan (111x61x1): Interpolated grid: $dx=1.000$ mm, $dy=1.000$ mm

Maximum value of SAR (interpolated) = 1.06 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5$ mm, $dy=5$ mm, $dz=5$ mm

Reference Value = 19.93 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 1.62 W/kg

SAR(1 g) = 0.823 W/kg; SAR(10 g) = 0.378 W/kg

Maximum value of SAR (measured) = 1.08 W/kg

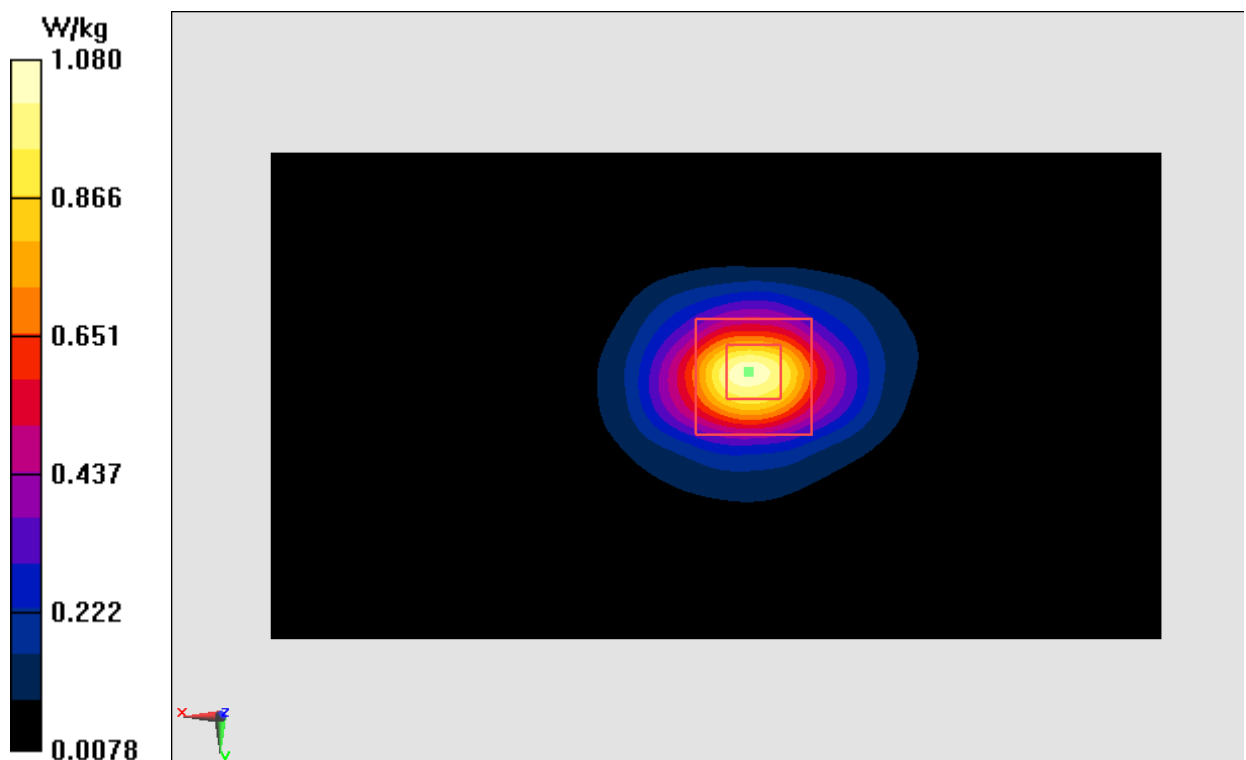


Fig.18 LTE Band7

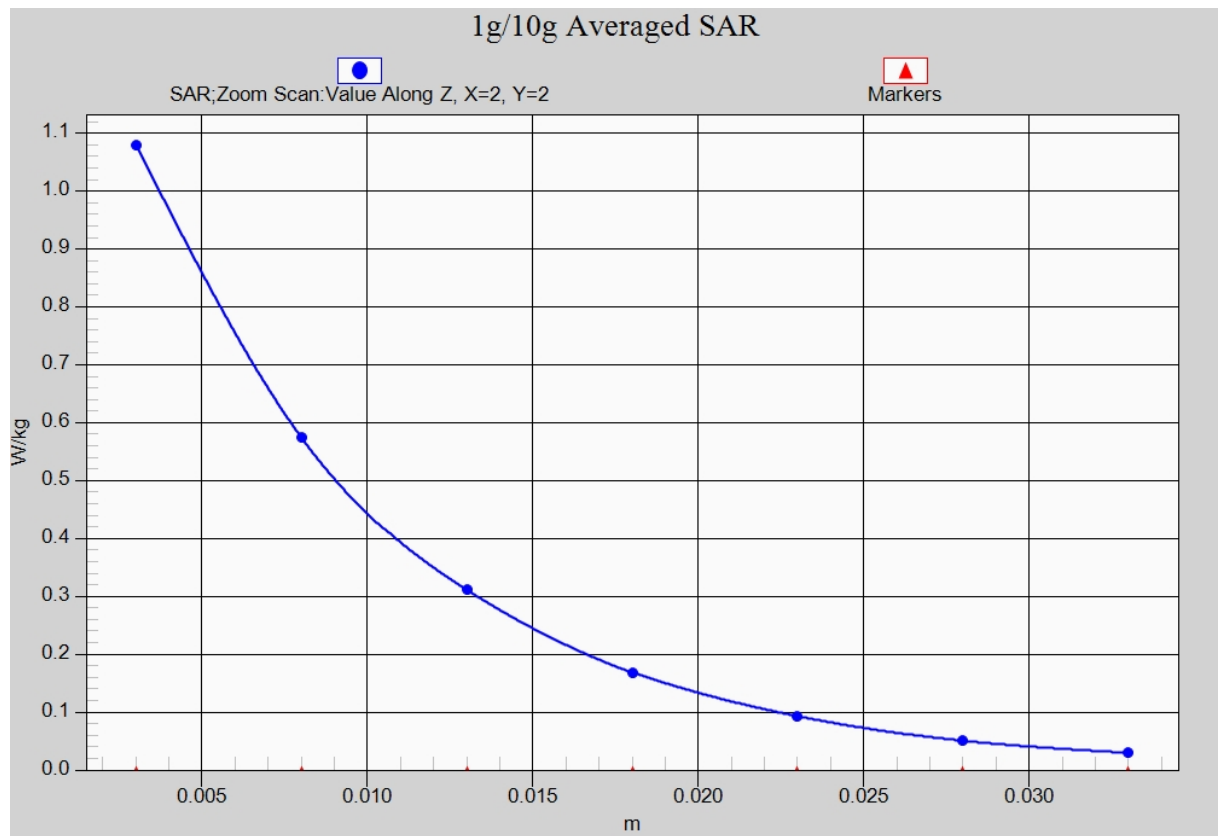


Fig. 18-1 Z-Scan at power reference point (LTE Band7)

LTE Band12LeftCheekMiddle with QPSK_10M_1RB_High

Date: 2017-4-12

Electronics: DAE4 Sn1331

Medium: Head750 MHz

Medium parameters used (interpolated): $f = 707.5$ MHz; $\sigma = 0.847$ mho/m; $\epsilon_r = 44.06$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.9°C Liquid Temperature: 22.5°C

Communication System: LTE Band12Frequency: 707.5 MHz Duty Cycle: 1:1

Probe: EX3DV4– SN3846 ConvF(9.65, 9.65, 9.65)

Area Scan (71x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.328 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 8.715 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 0.353 W/kg

SAR(1 g) = 0.300 W/kg; SAR(10 g) = 0.244 W/kg

Maximum value of SAR (measured) = 0.322 W/kg

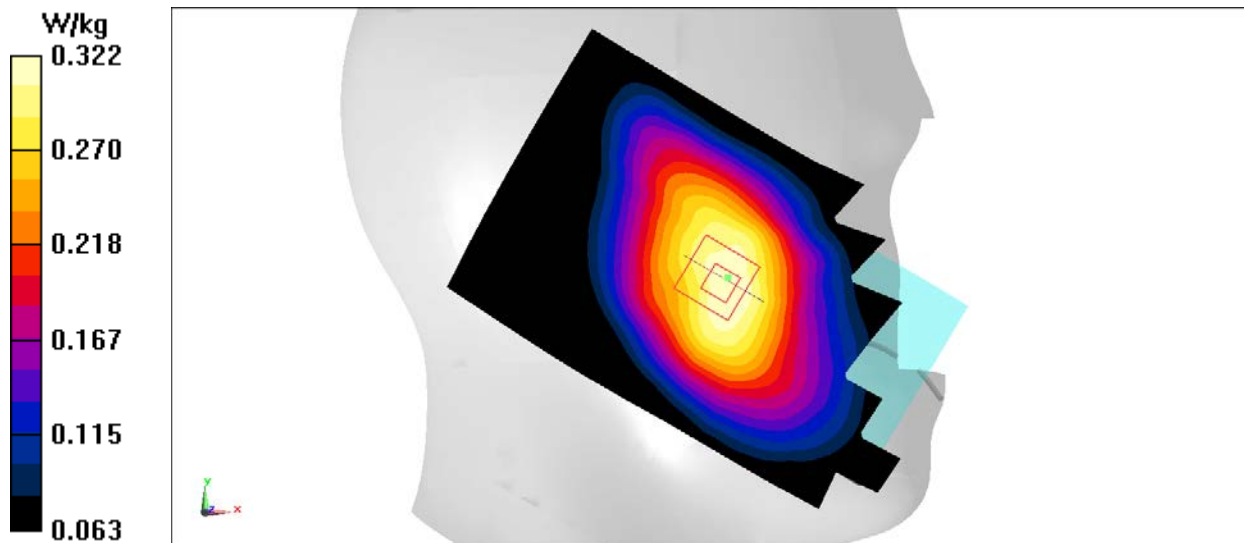


Fig.19 LTE Band12

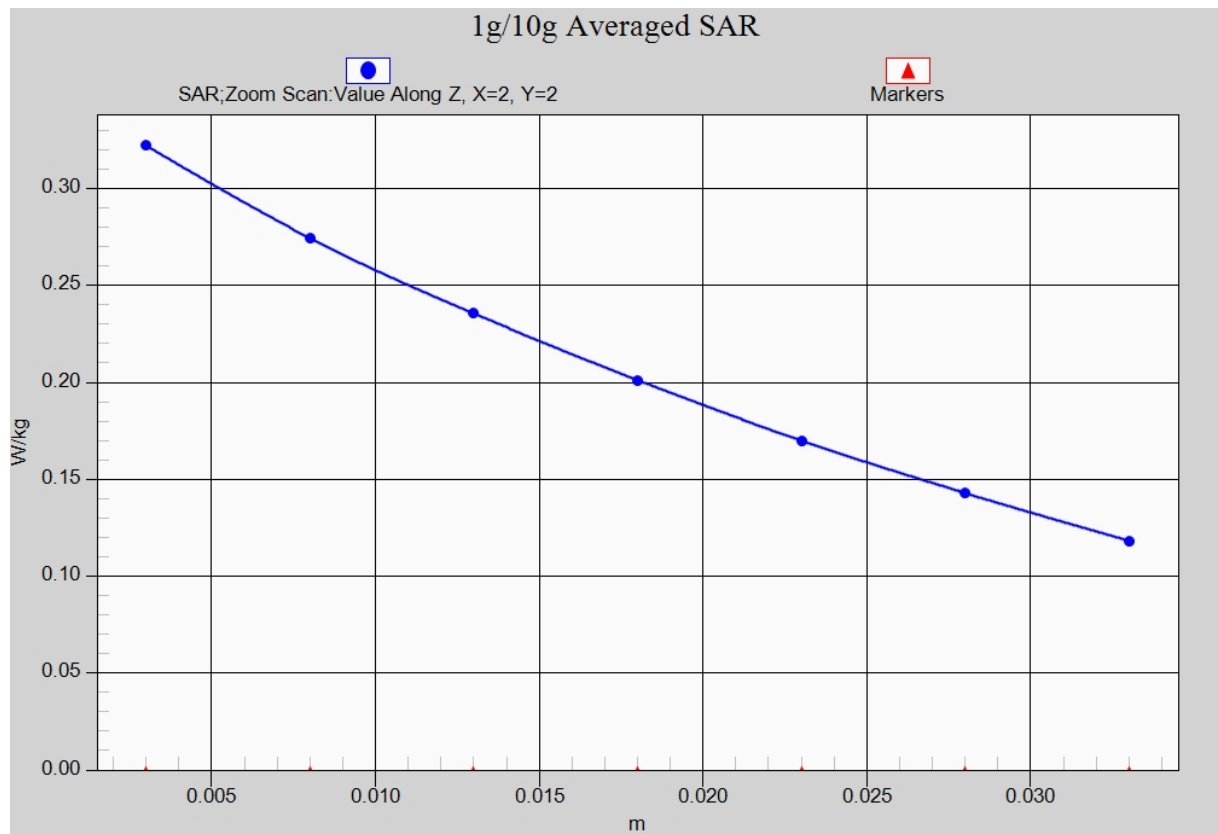


Fig. 19-1 Z-Scan at power reference point (LTE Band12)

LTE Band12Body LeftMiddle with QPSK_10M_1RB_High

Date: 2017-4-12

Electronics: DAE4 Sn1331

Medium: Body750 MHz

Medium parameters used (interpolated): $f = 707.5$ MHz; $\sigma = 0.897$ mho/m; $\epsilon_r = 58.49$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.9°C Liquid Temperature: 22.5°C

Communication System: LTE Band12Frequency: 707.5 MHz Duty Cycle: 1:1

Probe: EX3DV4– SN3846 ConvF(9.96, 9.96, 9.96)

Area Scan (111x61x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.518 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 23.22 V/m; Power Drift = -0.07 dB

Peak SAR (extrapolated) = 0.628 W/kg

SAR(1 g) = 0.456 W/kg; SAR(10 g) = 0.324 W/kg

Maximum value of SAR (measured) = 0.517 W/kg

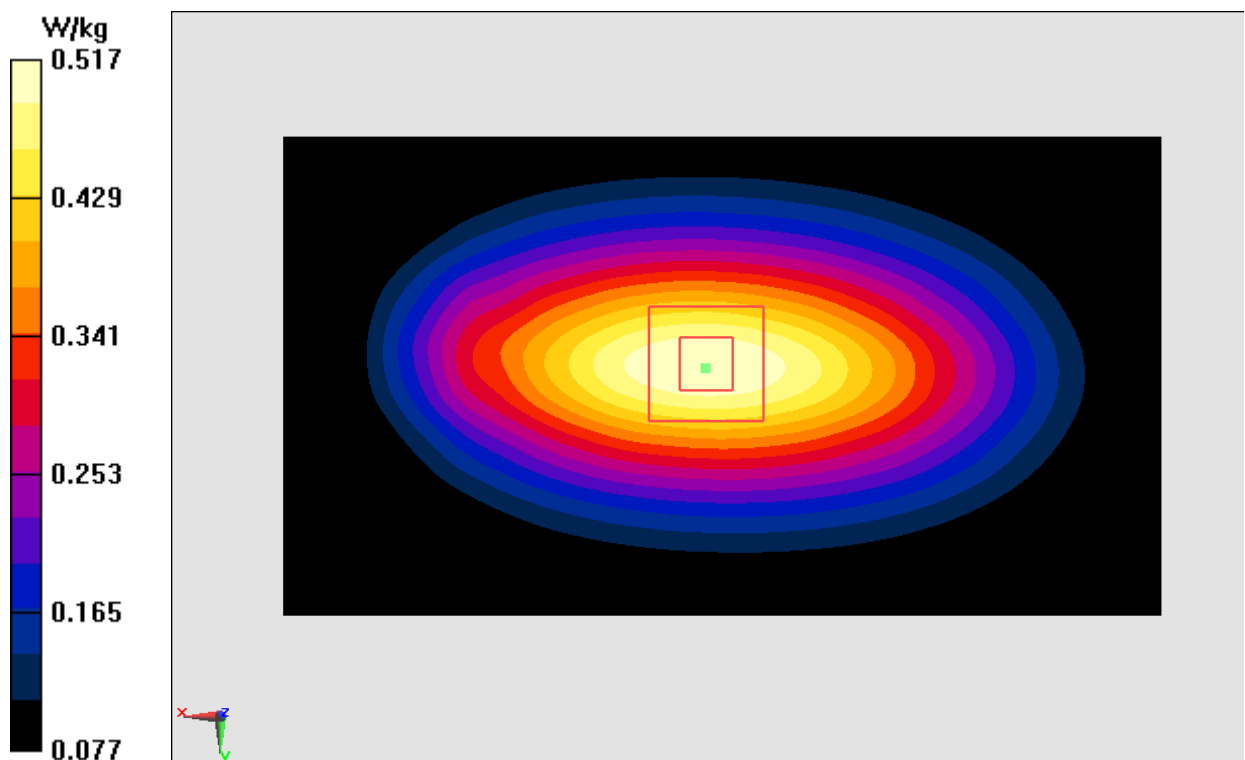


Fig.20 LTE Band12

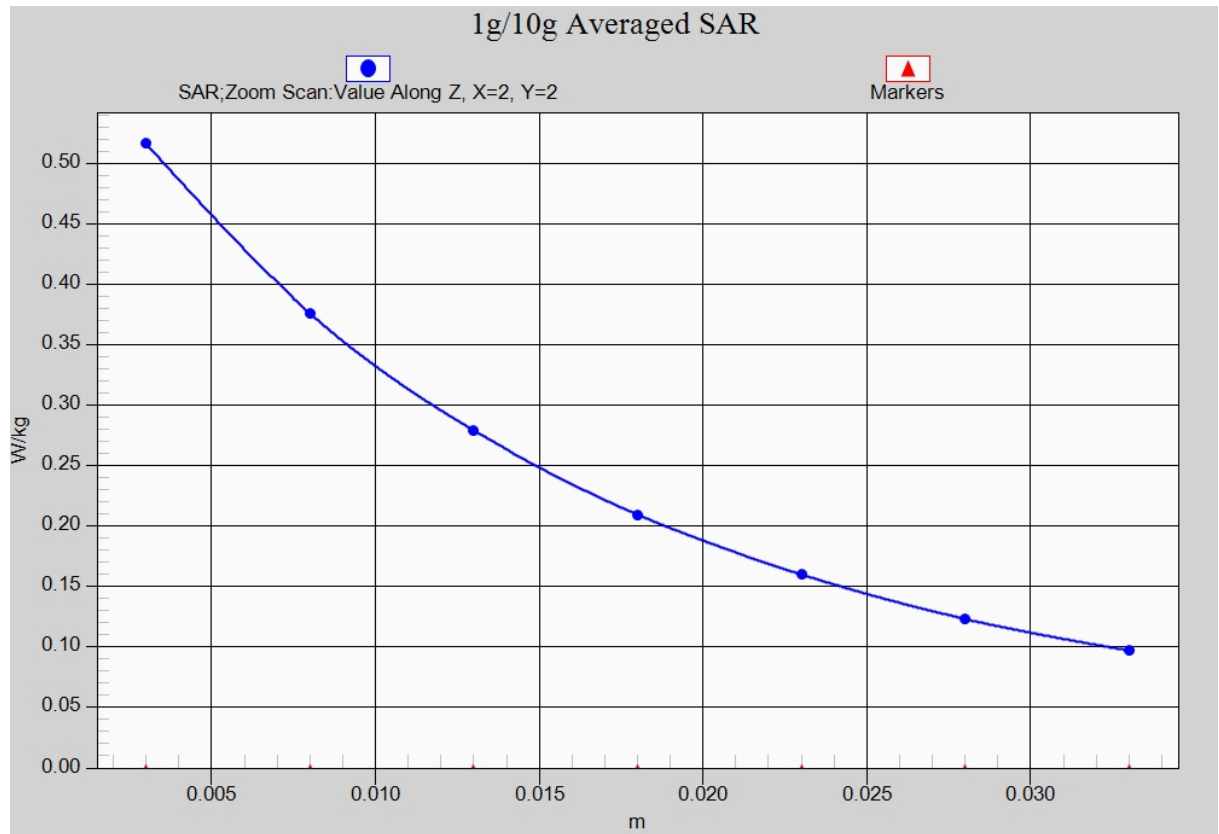


Fig. 20-1 Z-Scan at power reference point (LTE Band12)

Wifi 802.11bRightTiltChannel 1

Date: 2017-4-16

Electronics: DAE4 Sn1331

Medium: Head 2450 MHz

Medium parameters used (interpolated): $f = 2412$ MHz; $\sigma = 1.784$ mho/m; $\epsilon_r = 39.05$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.9°C Liquid Temperature: 22.5°C

Communication System: WLan 2450 Frequency: 2412 MHz Duty Cycle: 1:1

Probe: EX3DV4- SN3846 ConvF(7.22, 7.22, 7.22)

Area Scan (71x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.601 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 11.67 V/m; Power Drift = 0.10 dB

Peak SAR (extrapolated) = 1.07 W/kg

SAR(1 g) = 0.462 W/kg; SAR(10 g) = 0.213 W/kg

Maximum value of SAR (measured) = 0.570 W/kg

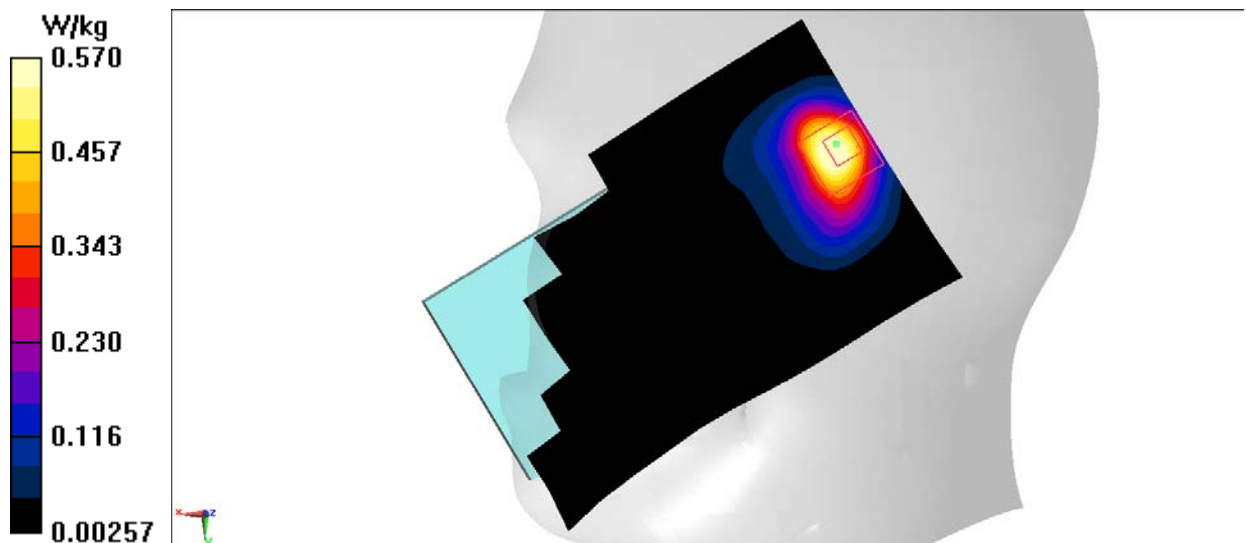


Fig.212450 MHz

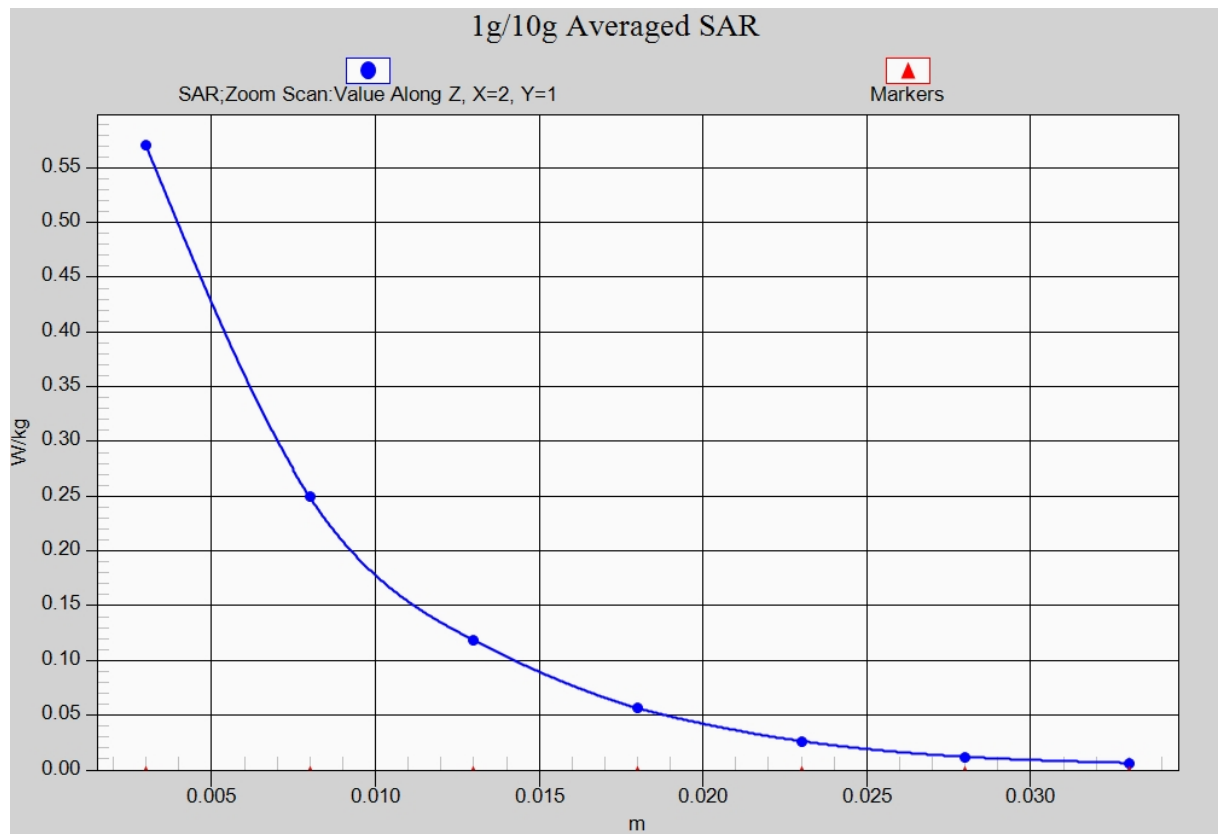


Fig. 21-1 Z-Scan at power reference point (2450 MHz)

Wifi 802.11b Body RearChannel 1

Date: 2017-4-16

Electronics: DAE4 Sn1331

Medium: Body 2450 MHz

Medium parameters used (interpolated): $f = 2412$ MHz; $\sigma = 1.966$ mho/m; $\epsilon_r = 53.36$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.9°C Liquid Temperature: 22.5°C

Communication System: WLan 2450 Frequency: 2412 MHz Duty Cycle: 1:1

Probe: EX3DV4 – SN3846 ConvF(7.31, 7.31, 7.31)

Area Scan (111x61x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.362 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 3.125 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 0.491 W/kg

SAR(1 g) = 0.245 W/kg; SAR(10 g) = 0.118 W/kg

Maximum value of SAR (measured) = 0.312 W/kg

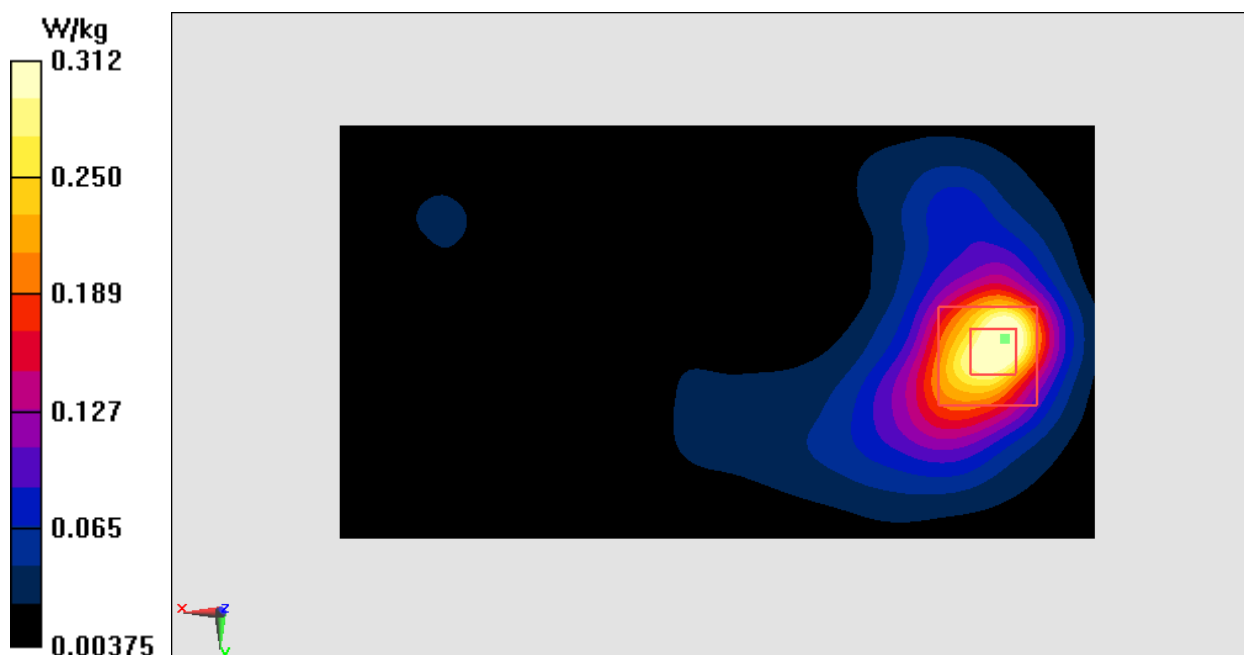


Fig.222450 MHz

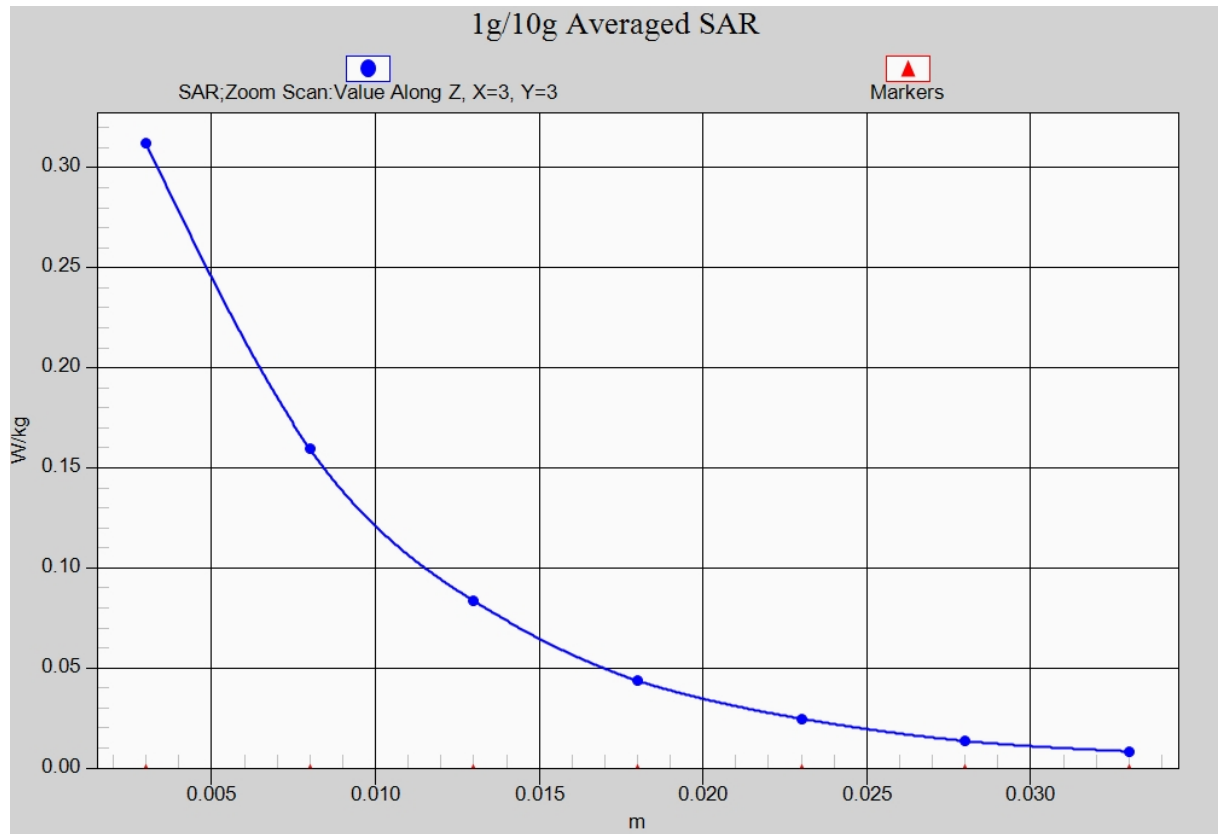


Fig. 22-1 Z-Scan at power reference point (2450 MHz)

Wifi 802.11aRightTiltChannel 165

Date: 2017-4-18

Electronics: DAE4 Sn1331

Medium: Head 5 GHz

Medium parameters used: $f = 5825$ MHz; $\sigma = 5.181$ mho/m; $\epsilon_r = 35.51$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.9°C Liquid Temperature: 22.5°C

Communication System: WLan 5G Frequency: 5825 MHz Duty Cycle: 1:1

Probe: EX3DV4- SN3846 ConvF(4.95, 4.95, 4.95)

Area Scan (101x171x1): Interpolated grid: $dx=1.000$ mm, $dy=1.000$ mm

Maximum value of SAR (interpolated) = 0.384 W/kg

Zoom Scan (8x8x7)/Cube 0: Measurement grid: $dx=4$ mm, $dy=4$ mm, $dz=1.4$ mm

Reference Value = 4.267 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 1.18 W/kg

SAR(1 g) = 0.259 W/kg; SAR(10 g) = 0.081 W/kg

Maximum value of SAR (measured) = 0.677 W/kg

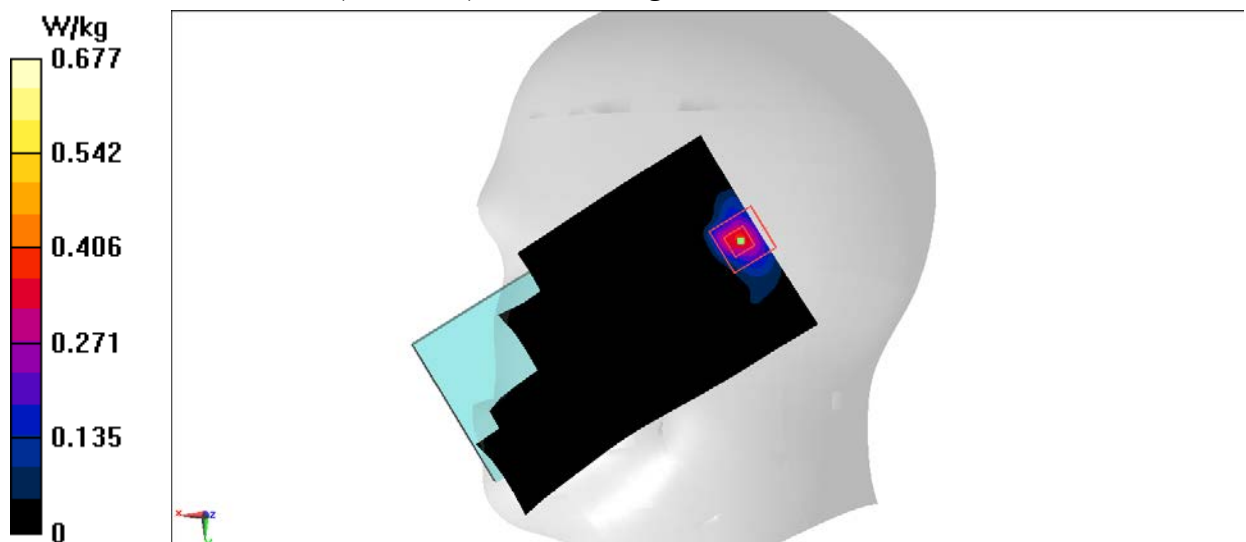


Fig.235GHz

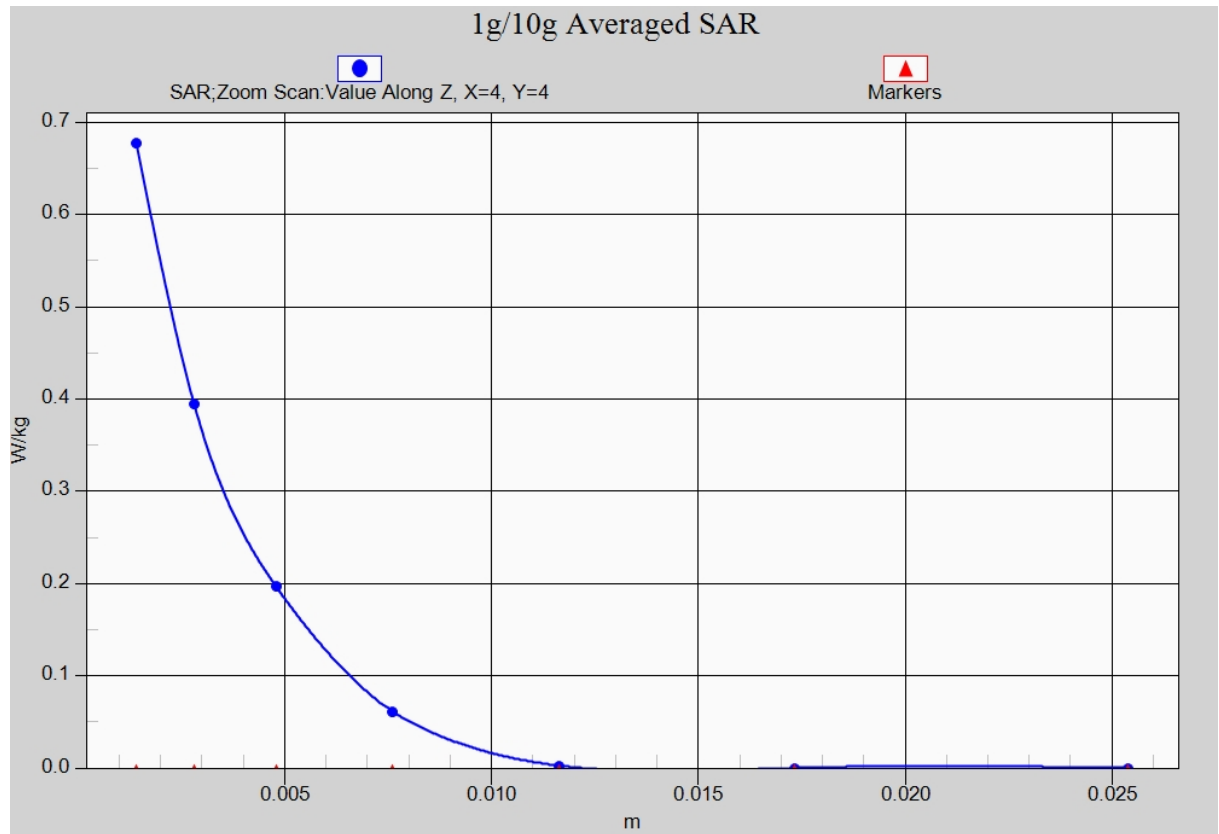


Fig. 23-1 Z-Scan at power reference point (5GHz)

Wifi 802.11aTopChannel 165

Date: 2017-4-18

Electronics: DAE4 Sn1331

Medium: Body5 GHz

Medium parameters used: $f = 5825$ MHz; $\sigma = 5.598$ mho/m; $\epsilon_r = 47.87$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.9°C Liquid Temperature: 22.5°C

Communication System: Wlan 5G Frequency: 5825 MHz Duty Cycle: 1:1

Probe: EX3DV4- SN3846 ConvF(4.53, 4.53, 4.53)

Area Scan (141x81x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.330 W/kg

Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 5.296 V/m; Power Drift = -0.11 dB

Peak SAR (extrapolated) = 0.692 W/kg

SAR(1 g) = 0.166 W/kg; SAR(10 g) = 0.064 W/kg

Maximum value of SAR (measured) = 0.390 W/kg

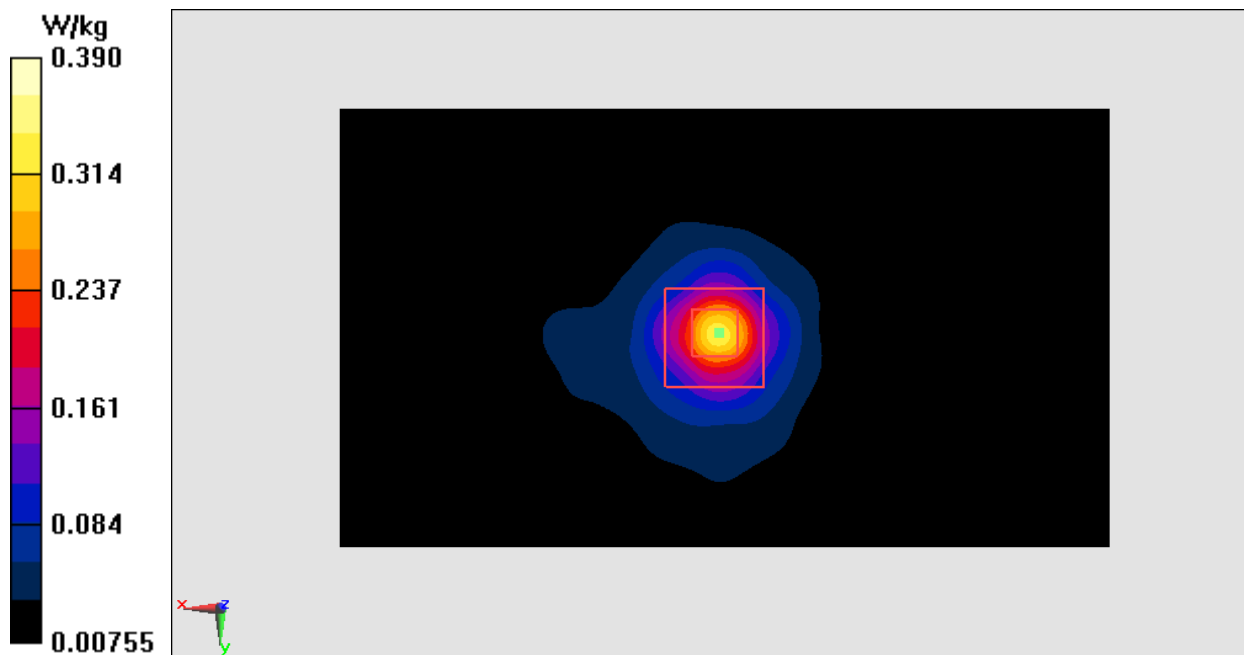


Fig.245GHz

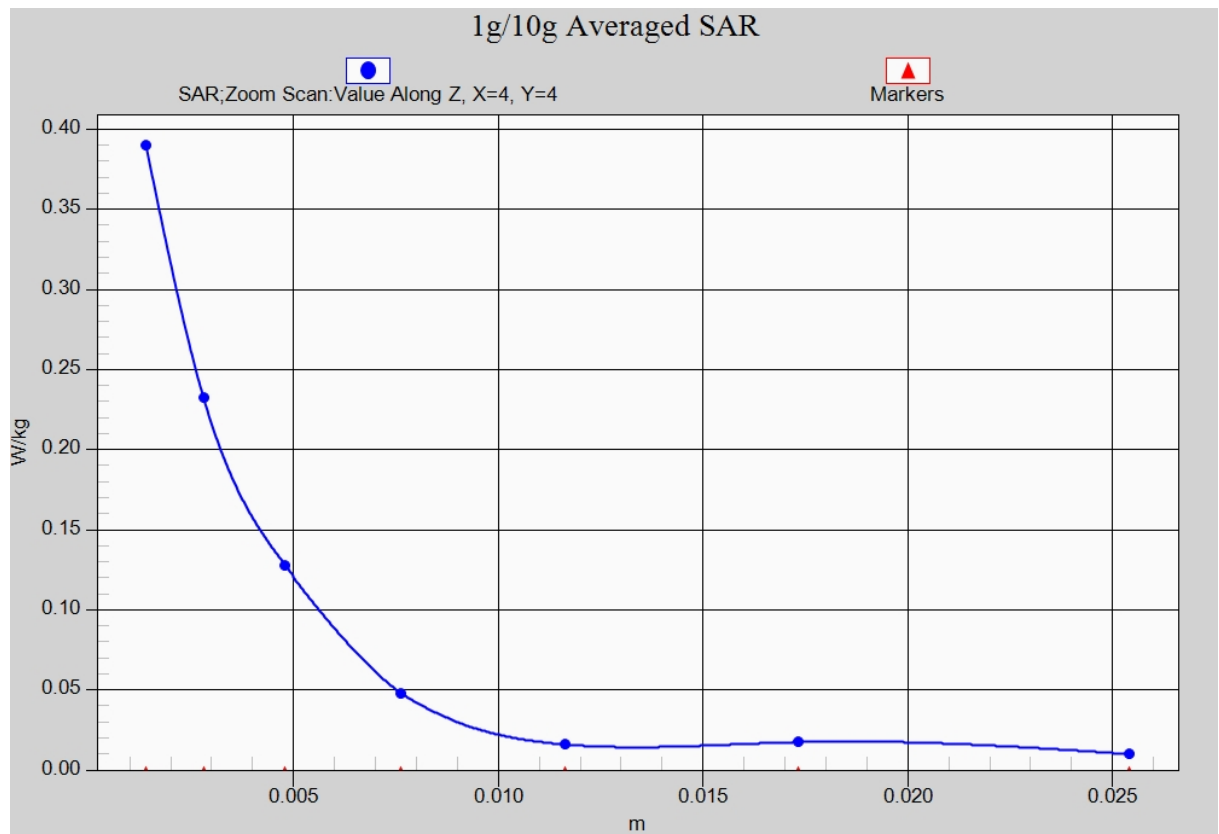


Fig. 24-1 Z-Scan at power reference point (5GHz)

ANNEX B SystemVerification Results

750 MHz

Date: 4/12/2017

Electronics: DAE4 Sn1331

Medium: Head750 MHz

Medium parameters used: $f = 750 \text{ MHz}$; $\sigma = 0.898 \text{ mho/m}$; $\epsilon_r = 41.7$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature: 22.5°C Liquid Temperature: 23.3°C

Communication System: CW Frequency: 750 MHz Duty Cycle: 1:1

Probe: EX3DV4 – SN3846 ConvF(9.65, 9.65, 9.65)

System Validation /Area Scan (81x191x1): Interpolated grid: $dx=1.000 \text{ mm}$, $dy=1.000 \text{ mm}$

Reference Value = 59.58 V/m ; Power Drift = .01

Fast SAR: SAR(1 g) = 2.05 W/kg ; SAR(10 g) = 1.39 W/kg

Maximum value of SAR (interpolated) = 2.75 W/kg

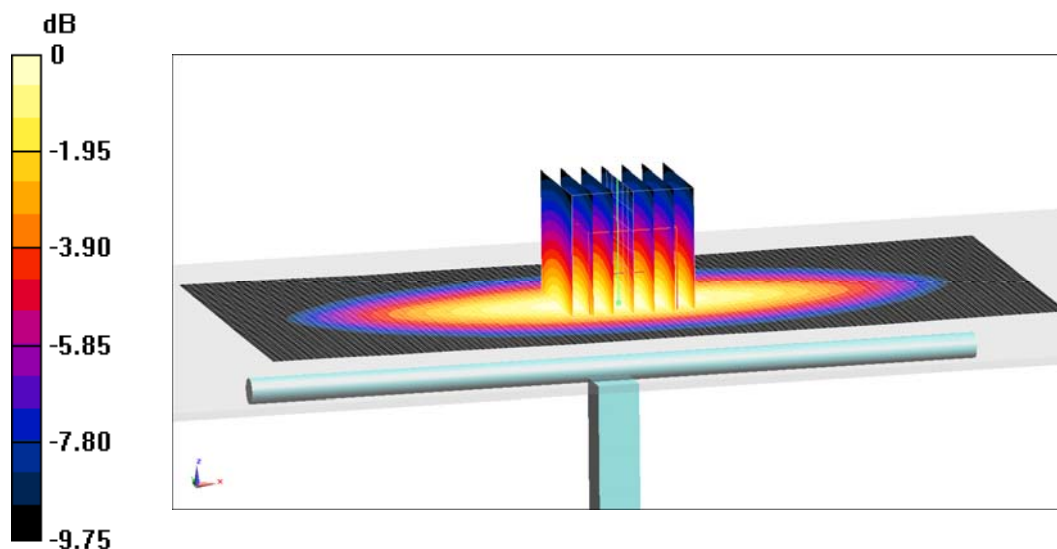
System Validation /Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 59.58 V/m ; Power Drift = .01 dB

Peak SAR (extrapolated) = 3.16 W/kg

SAR(1 g) = 2.08 W/kg ; SAR(10 g) = 1.35 W/kg

Maximum value of SAR (measured) = 2.83 W/kg



0 dB = 2.83 W/kg = 4.52 dB W/kg

Fig.B.1 validation 750 MHz 250mW

750 MHz

Date: 4/12/2017

Electronics: DAE4 Sn1331

Medium: Body750 MHz

Medium parameters used: $f = 750 \text{ MHz}$; $\sigma = 0.951 \text{ mho/m}$; $\epsilon_r = 55.35$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature: 22.5°C Liquid Temperature: 23.3°C

Communication System: CW Frequency: 750 MHz Duty Cycle: 1:1

Probe: EX3DV4 – SN3846 ConvF(9.96, 9.96, 9.96)

System Validation /Area Scan (81x191x1): Interpolated grid: $dx=1.000 \text{ mm}$, $dy=1.000 \text{ mm}$

Reference Value = 56.94 V/m ; Power Drift = -0.01

Fast SAR: SAR(1 g) = 2.08 W/kg ; SAR(10 g) = 1.37 W/kg

Maximum value of SAR (interpolated) = 2.84 W/kg

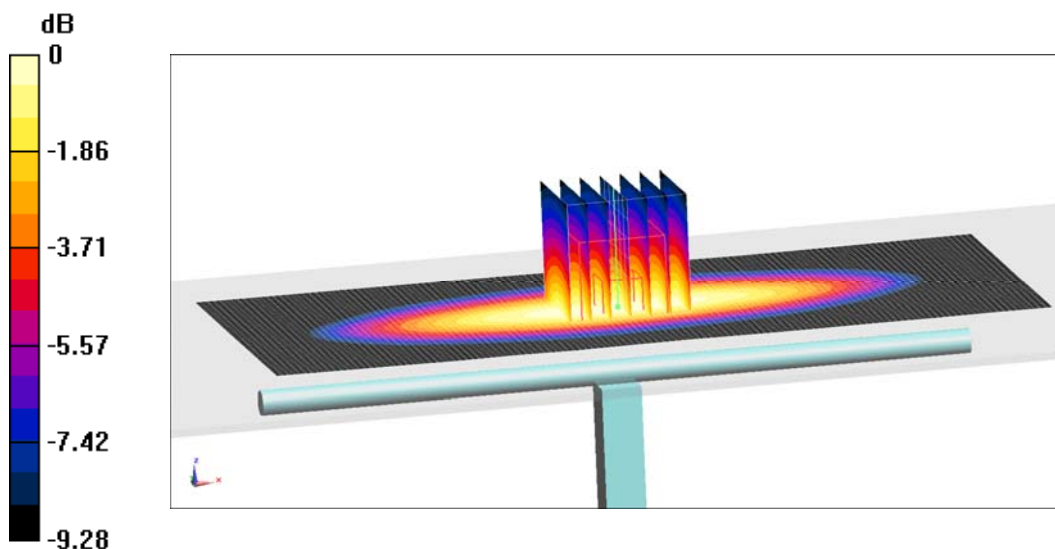
System Validation /Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 56.94 V/m ; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 3.33 W/kg

SAR(1 g) = 2.12 W/kg ; SAR(10 g) = 1.36 W/kg

Maximum value of SAR (measured) = 2.97 W/kg



$0 \text{ dB} = 2.97 \text{ W/kg} = 4.73 \text{ dB W/kg}$

Fig.B.2 validation 750 MHz 250mW

835 MHz

Date: 4/13/2017

Electronics: DAE4 Sn1331

Medium: Head835 MHz

Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 0.901 \text{ mho/m}$; $\epsilon_r = 41.6$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature: 22.5°C Liquid Temperature: 23.3°C

Communication System: CW Frequency: 835 MHz Duty Cycle: 1:1

Probe: EX3DV4 – SN3846 ConvF(9.33,9.33,9.33)

System Validation /Area Scan (81x191x1): Interpolated grid: $dx=1.000 \text{ mm}$, $dy=1.000 \text{ mm}$

Reference Value = 61.02 V/m ; Power Drift = .01

Fast SAR: SAR(1 g) = 2.36 W/kg ; SAR(10 g) = 1.53 W/kg

Maximum value of SAR (interpolated) = 3.27 W/kg

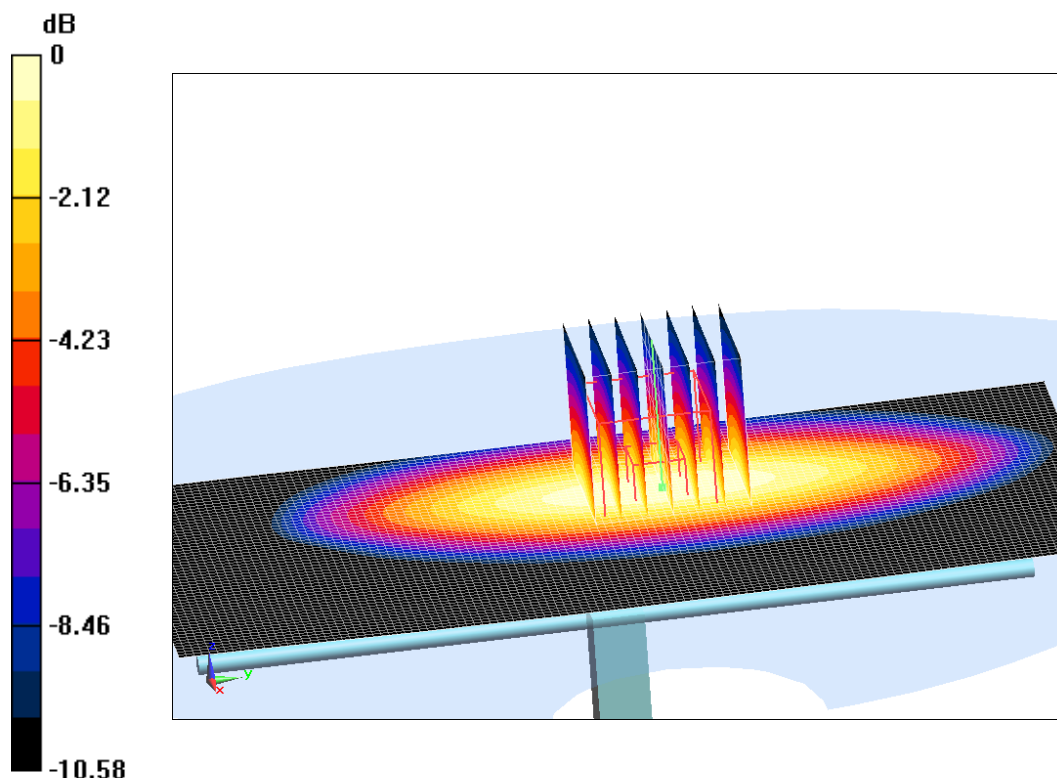
System Validation /Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 61.02 V/m ; Power Drift = .01 dB

Peak SAR (extrapolated) = 3.72 W/kg

SAR(1 g) = 2.39 W/kg ; SAR(10 g) = 1.55 W/kg

Maximum value of SAR (measured) = 3.35 W/kg



0 dB = 3.35 W/kg = 5.25 dB W/kg

Fig.B.3 validation 835 MHz 250mW

835 MHz

Date: 4/13/2017

Electronics: DAE4 Sn1331

Medium: Body835 MHz

Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 0.988 \text{ mho/m}$; $\epsilon_r = 56.1$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature: 22.5°C Liquid Temperature: 23.3°C

Communication System: CW Frequency: 835 MHz Duty Cycle: 1:1

Probe: EX3DV4 – SN3846 ConvF(9.52,9.52,9.52)

System Validation /Area Scan (81x191x1): Interpolated grid: $dx=1.000 \text{ mm}$, $dy=1.000 \text{ mm}$

Reference Value = 60.5 V/m ; Power Drift = -0.03

Fast SAR: SAR(1 g) = 2.33 W/kg ; SAR(10 g) = 1.53 W/kg

Maximum value of SAR (interpolated) = 3.43 W/kg

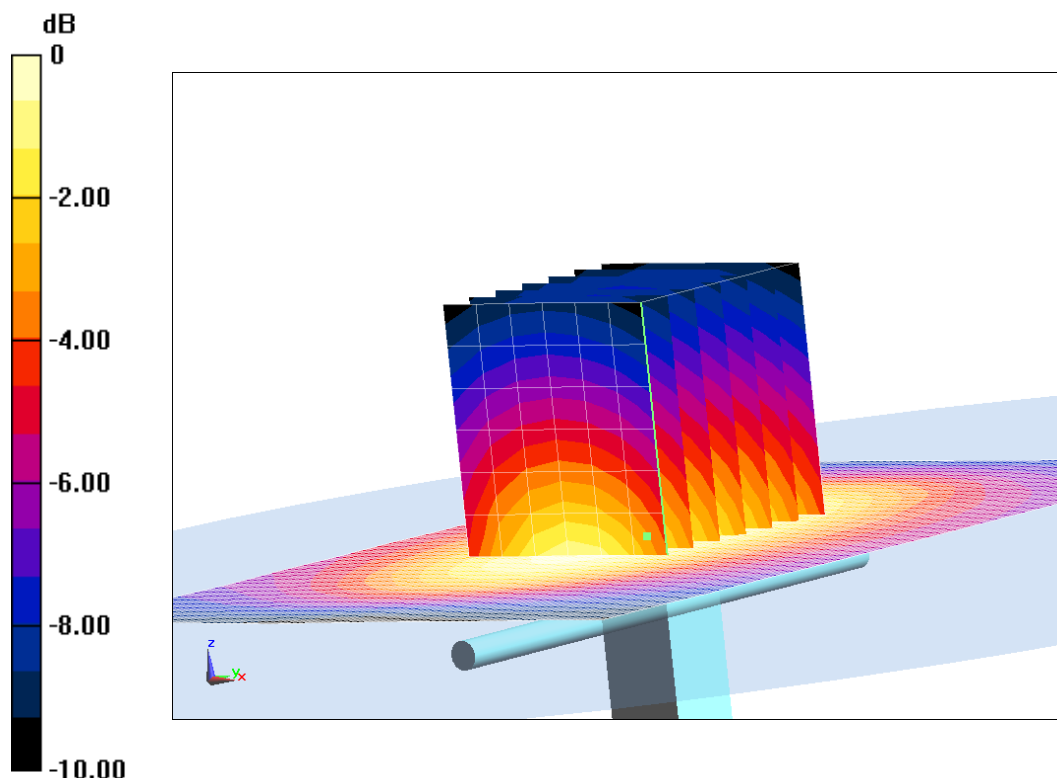
System Validation /Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 60.5 V/m ; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 3.71 W/kg

SAR(1 g) = 2.32 W/kg ; SAR(10 g) = 1.56 W/kg

Maximum value of SAR (measured) = 3.29 W/kg



$0 \text{ dB} = 3.29 \text{ W/kg} = 5.17 \text{ dB W/kg}$

Fig.B.4 validation 835 MHz 250mW

1750 MHz

Date: 4/14/2017

Electronics: DAE4 Sn1331

Medium: Head1750 MHz

Medium parameters used: $f = 1750$ MHz; $\sigma = 1.38$ mho/m; $\epsilon_r = 40.68$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.5°C Liquid Temperature: 23.3°C

Communication System: CW Frequency: 1750 MHz Duty Cycle: 1:1

Probe: EX3DV4 – SN3846 ConvF(8.16,8.16,8.16)

System Validation /Area Scan (81x191x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Reference Value = 104.01 V/m; Power Drift = .02

Fast SAR: SAR(1 g) = 9.08W/kg; SAR(10 g) = 4.88 W/kg

Maximum value of SAR (interpolated) = 14.6 W/kg

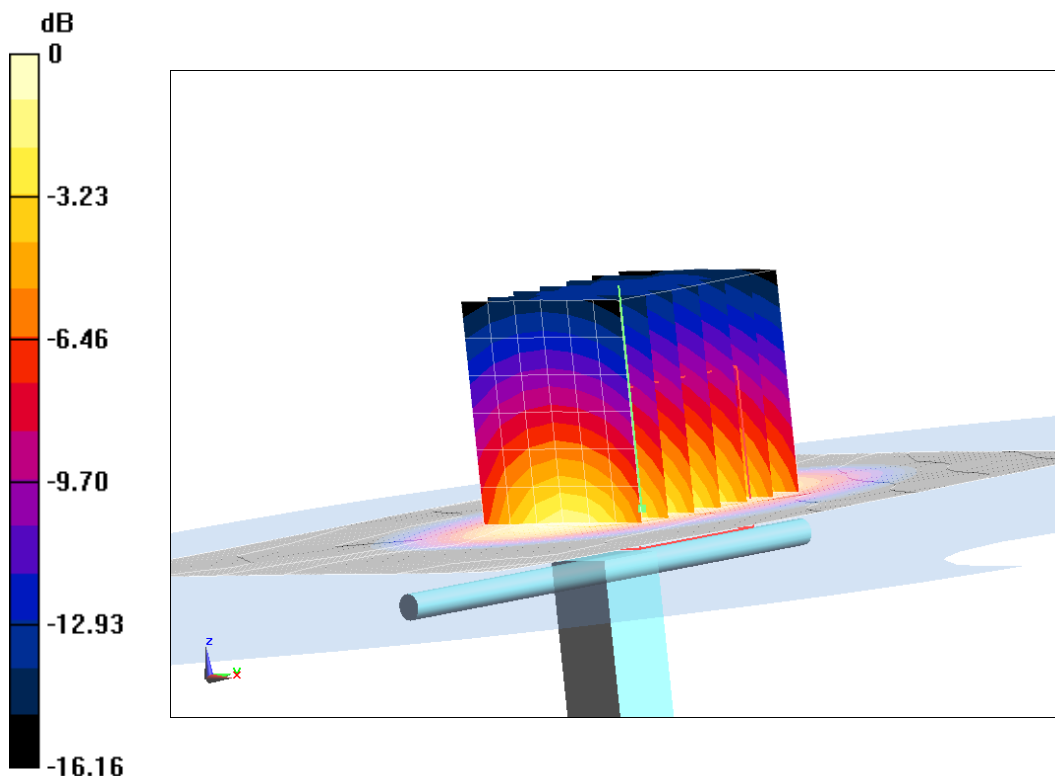
System Validation /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value =104.01 V/m; Power Drift = .02 dB

Peak SAR (extrapolated) = 16.93 W/kg

SAR(1 g) = 9.06W/kg; SAR(10 g) = 4.9 W/kg

Maximum value of SAR (measured) = 14.2 W/kg



0 dB = 14.2 W/kg = 11.52 dB W/kg

Fig.B.5 validation 1750 MHz 250mW

1750 MHz

Date: 4/14/2017

Electronics: DAE4 Sn1331

Medium: Body1750 MHz

Medium parameters used: $f = 1750$ MHz; $\sigma = 1.514$ mho/m; $\epsilon_r = 53.22$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.5°C Liquid Temperature: 23.3°C

Communication System: CW Frequency: 1750 MHz Duty Cycle: 1:1

Probe: EX3DV4 – SN3846 ConvF(7.9,7.9,7.9)

System Validation /Area Scan (81x191x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Reference Value = 103.14 V/m; Power Drift = .01

Fast SAR: SAR(1 g) = 9.08W/kg; SAR(10 g) = 4.86 W/kg

Maximum value of SAR (interpolated) = 13.63 W/kg

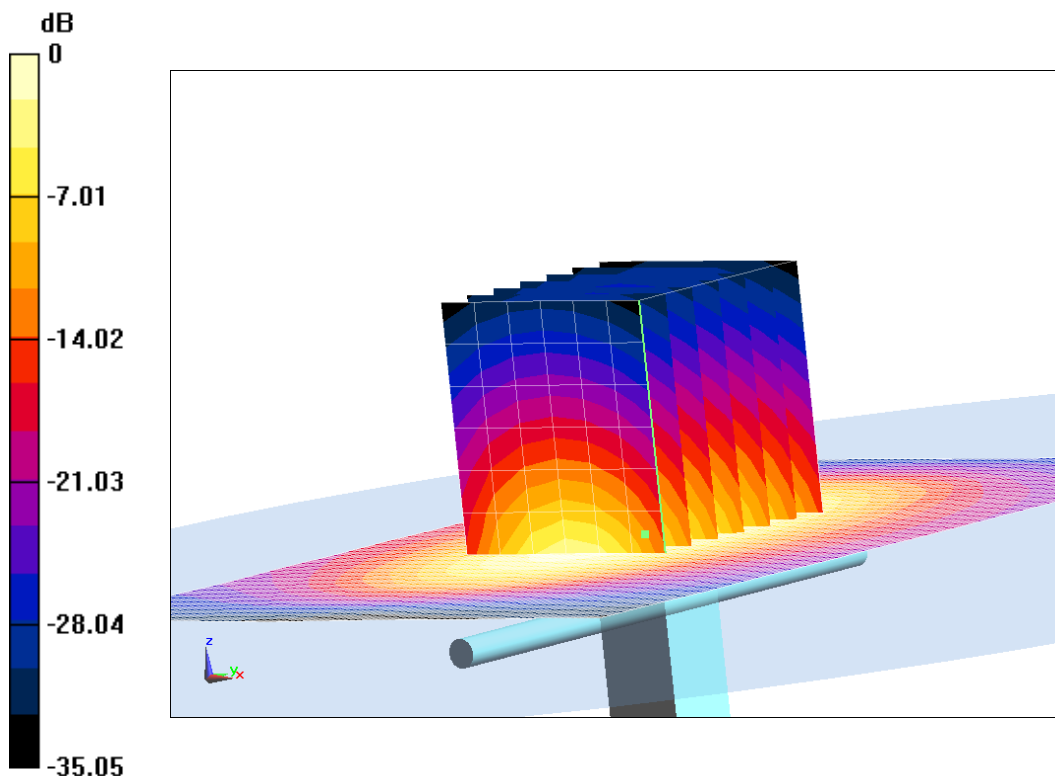
System Validation /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value =103.14 V/m; Power Drift = .01 dB

Peak SAR (extrapolated) = 15.98 W/kg

SAR(1 g) = 9.12W/kg; SAR(10 g) = 4.94 W/kg

Maximum value of SAR (measured) = 13.73 W/kg



0 dB = 13.73 W/kg = 11.38 dB W/kg

Fig.B.6 validation 1750 MHz 250mW

1900 MHz

Date: 4/15/2017

Electronics: DAE4 Sn1331

Medium: Head1900 MHz

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.39$ mho/m; $\epsilon_r = 39.55$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.5°C Liquid Temperature: 23.3°C

Communication System: CW Frequency: 1900 MHz Duty Cycle: 1:1

Probe: EX3DV4 – SN3846 ConvF(7.89,7.89,7.89)

System Validation /Area Scan (81x191x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Reference Value = 106.76 V/m; Power Drift = .01

Fast SAR: SAR(1 g) = 10.21W/kg; SAR(10 g) = 5.3 W/kg

Maximum value of SAR (interpolated) = 15.47 W/kg

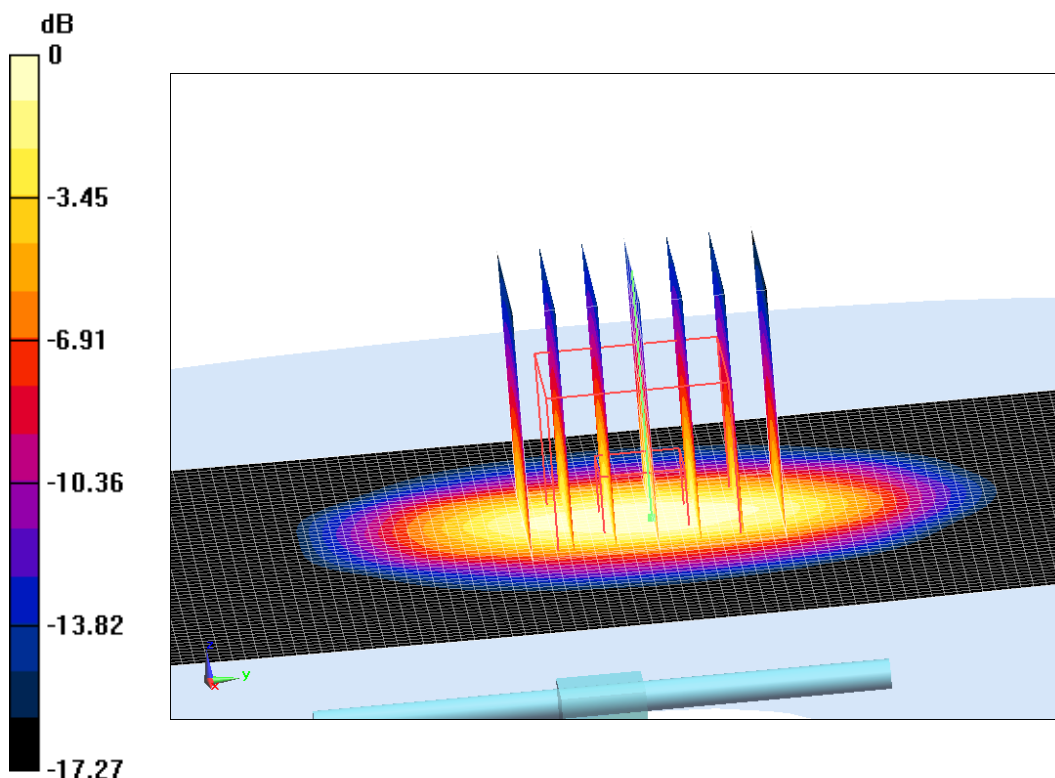
System Validation /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 106.76 V/m; Power Drift = .01 dB

Peak SAR (extrapolated) = 18.92 W/kg

SAR(1 g) = 10.32W/kg; SAR(10 g) = 5.25 W/kg

Maximum value of SAR (measured) = 15.7 W/kg



0 dB = 15.7 W/kg = 11.96 dB W/kg

Fig.B.7 validation 1900 MHz 250mW

1900 MHz

Date: 4/15/2017

Electronics: DAE4 Sn1331

Medium: Body1900 MHz

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.536$ mho/m; $\epsilon_r = 53.19$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.5°C Liquid Temperature: 23.3°C

Communication System: CW Frequency: 1900 MHz Duty Cycle: 1:1

Probe: EX3DV4 – SN3846 ConvF(7.57,7.57,7.57)

System Validation /Area Scan (81x191x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Reference Value = 105.78 V/m; Power Drift = -.01

Fast SAR: SAR(1 g) = 10.35W/kg; SAR(10 g) = 5.26 W/kg

Maximum value of SAR (interpolated) = 14.84 W/kg

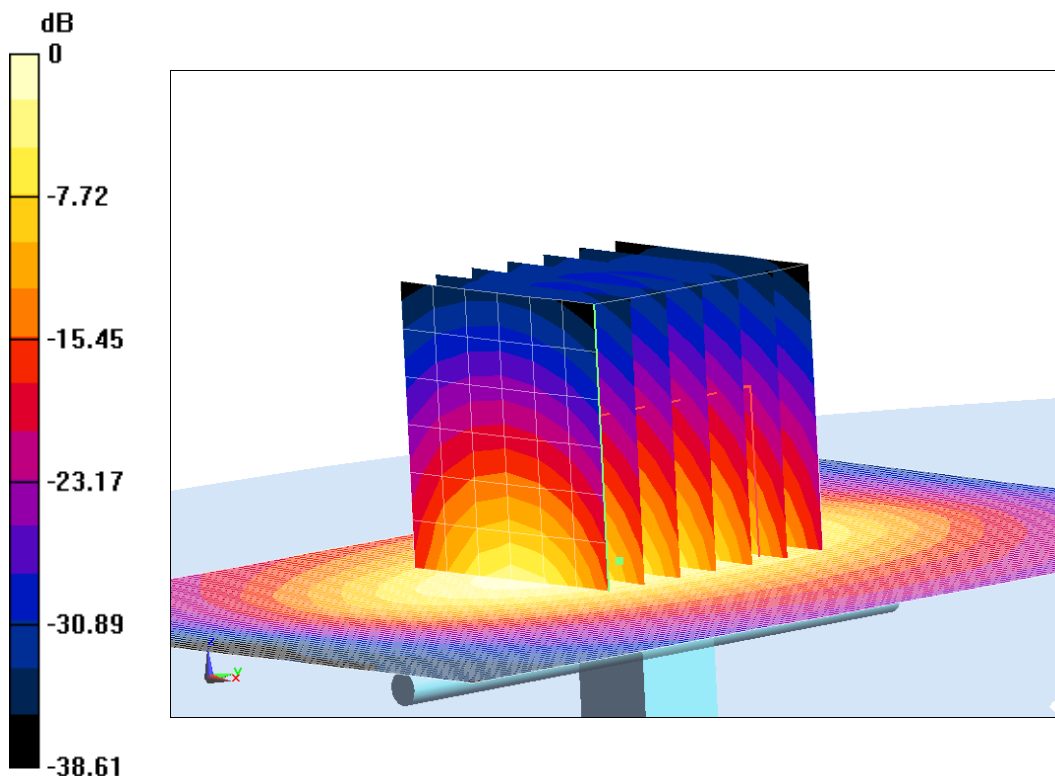
System Validation /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value =105.78 V/m; Power Drift = -.01 dB

Peak SAR (extrapolated) = 17.85 W/kg

SAR(1 g) = 10.08W/kg; SAR(10 g) = 5.23 W/kg

Maximum value of SAR (measured) = 14.7 W/kg



0 dB = 14.7 W/kg = 11.67 dB W/kg

Fig.B.8 validation 1900 MHz 250mW

2450 MHz

Date: 4/16/2017

Electronics: DAE4 Sn1331

Medium: Head2450 MHz

Medium parameters used: $f = 2450 \text{ MHz}$; $\sigma = 1.784 \text{ mho/m}$; $\epsilon_r = 39.05$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature: 22.5°C Liquid Temperature: 23.3°C

Communication System: CW Frequency: 2450 MHz Duty Cycle: 1:1

Probe: EX3DV4 – SN3846 ConvF(7.22,7.22,7.22)

System Validation /Area Scan (81x191x1): Interpolated grid: $dx=1.000 \text{ mm}$, $dy=1.000 \text{ mm}$

Reference Value = 116.11 V/m ; Power Drift = $-.03$

Fast SAR: SAR(1 g) = 13.1 W/kg ; SAR(10 g) = 6.06 W/kg

Maximum value of SAR (interpolated) = 22.66 W/kg

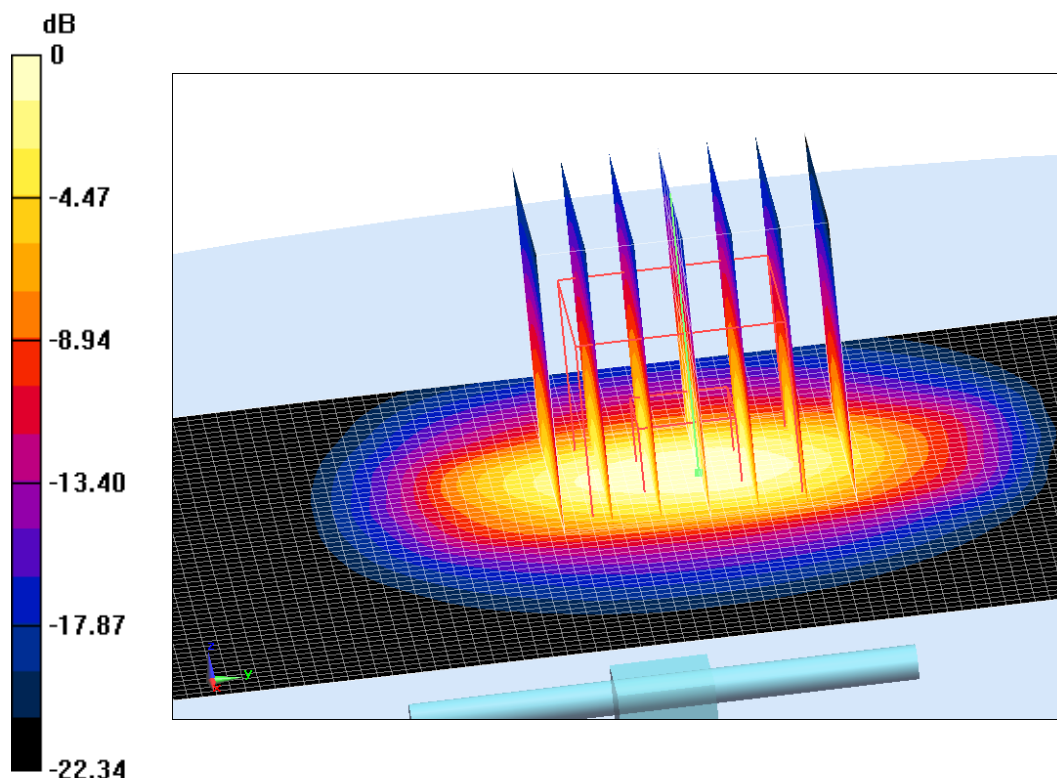
System Validation /Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 116.11 V/m ; Power Drift = $-.03 \text{ dB}$

Peak SAR (extrapolated) = 27.32 W/kg

SAR(1 g) = 13.44 W/kg ; SAR(10 g) = 6.26 W/kg

Maximum value of SAR (measured) = 22.63 W/kg



$0 \text{ dB} = 22.63 \text{ W/kg} = 13.55 \text{ dB W/kg}$

Fig.B.9 validation 2450 MHz 250mW

2450 MHz

Date: 4/16/2017

Electronics: DAE4 Sn1331

Medium: Body2450 MHz

Medium parameters used: $f = 2450$ MHz; $\sigma = 1.966$ mho/m; $\epsilon_r = 53.36$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.5°C Liquid Temperature: 23.3°C

Communication System: CW Frequency: 2450 MHz Duty Cycle: 1:1

Probe: EX3DV4 – SN3846 ConvF(7.31,7.31,7.31)

System Validation /Area Scan (81x191x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Reference Value = 107.13 V/m; Power Drift = -.01

Fast SAR: SAR(1 g) = 13.36W/kg; SAR(10 g) = 6.17 W/kg

Maximum value of SAR (interpolated) = 22.05 W/kg

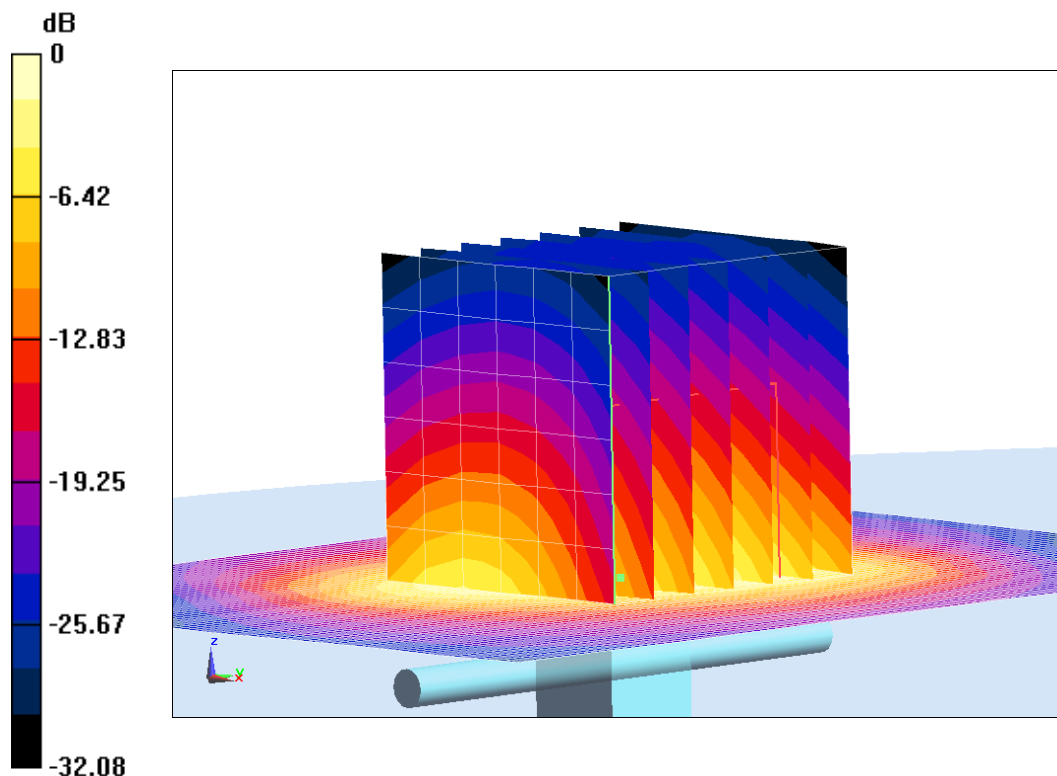
System Validation /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value =107.13 V/m; Power Drift = -.01 dB

Peak SAR (extrapolated) = 26.52 W/kg

SAR(1 g) = 13.06W/kg; SAR(10 g) = 6.06 W/kg

Maximum value of SAR (measured) = 21.71 W/kg



0 dB = 21.71 W/kg = 13.37 dB W/kg

Fig.B.10 validation 2450 MHz 250mW

2600 MHz

Date: 4/17/2017

Electronics: DAE4 Sn1331

Medium: Head2600 MHz

Medium parameters used: $f = 2600$ MHz; $\sigma = 1.966$ mho/m; $\epsilon_r = 39.57$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.5°C Liquid Temperature: 23.3°C

Communication System: CW Frequency: 2600 MHz Duty Cycle: 1:1

Probe: EX3DV4 – SN3846 ConvF(7.12,7.12,7.12)

System Validation /Area Scan (81x191x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Reference Value = 115.02 V/m; Power Drift = -.02

Fast SAR: SAR(1 g) = 14.04W/kg; SAR(10 g) = 6.23 W/kg

Maximum value of SAR (interpolated) = 24.71 W/kg

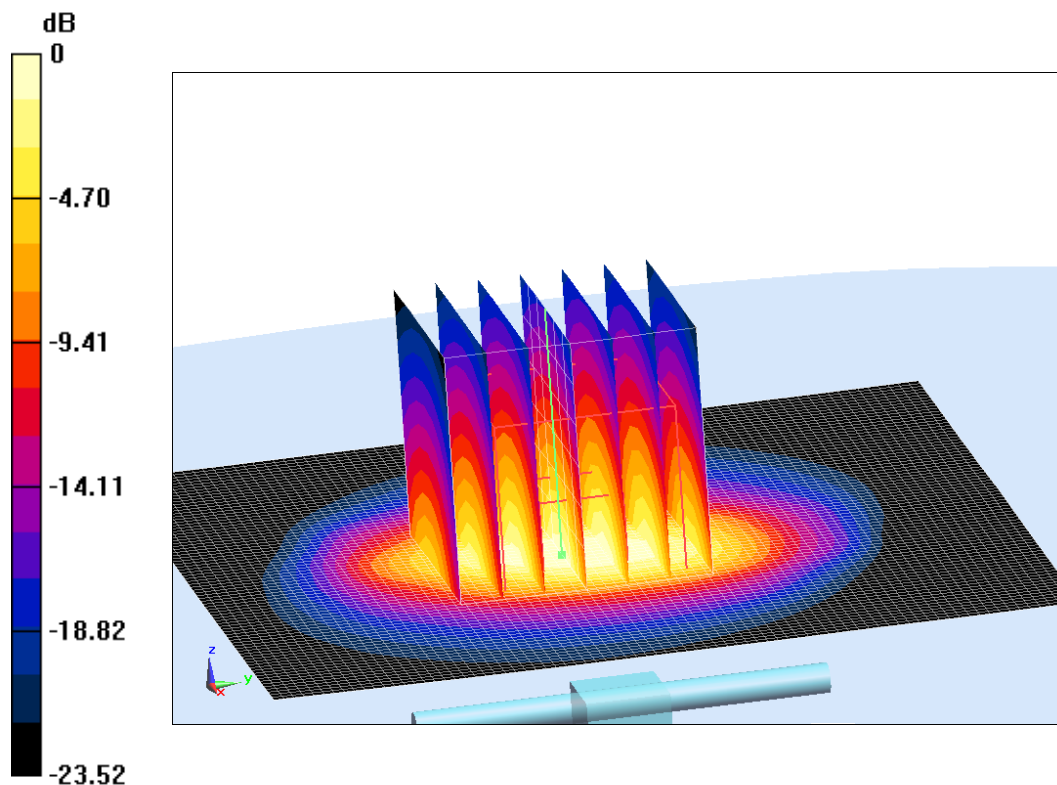
System Validation /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value =115.02 V/m; Power Drift = -.02 dB

Peak SAR (extrapolated) = 30.77 W/kg

SAR(1 g) = 14.4W/kg; SAR(10 g) = 6.34 W/kg

Maximum value of SAR (measured) = 24.43 W/kg



0 dB = 24.43 W/kg = 13.88 dB W/kg

Fig.B.11 validation 2600 MHz 250mW

2600 MHz

Date: 4/17/2017

Electronics: DAE4 Sn1331

Medium: Body2600 MHz

Medium parameters used: $f = 2600$ MHz; $\sigma = 2.138$ mho/m; $\epsilon_r = 51.61$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.5°C Liquid Temperature: 23.3°C

Communication System: CW Frequency: 2600 MHz Duty Cycle: 1:1

Probe: EX3DV4 – SN3846 ConvF(7.25,7.25,7.25)

System Validation /Area Scan (81x191x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Reference Value = 109.93 V/m; Power Drift = -.01

Fast SAR: SAR(1 g) = 14.22W/kg; SAR(10 g) = 6.19 W/kg

Maximum value of SAR (interpolated) = 23.31 W/kg

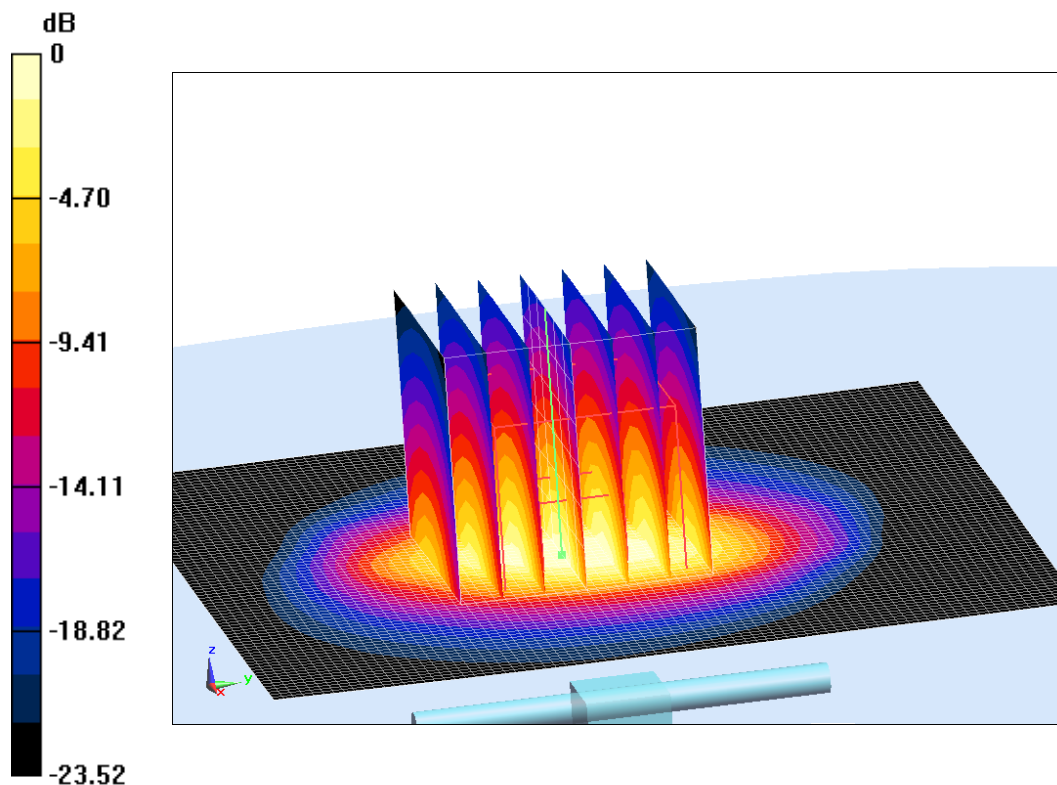
System Validation /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value =109.93 V/m; Power Drift = -.01 dB

Peak SAR (extrapolated) = 28.93 W/kg

SAR(1 g) = 13.95W/kg; SAR(10 g) = 6.4 W/kg

Maximum value of SAR (measured) = 23.92 W/kg



0 dB = 23.92 W/kg = 13.79 dB W/kg

Fig.B.12 validation 2600 MHz 250mW

5250 MHz

Date: 4/18/2017

Electronics: DAE4 Sn1331

Medium: Head5250 MHz

Medium parameters used: $f = 5250 \text{ MHz}$; $\sigma = 4.618 \text{ mho/m}$; $\epsilon_r = 36.09$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature: 22.5°C Liquid Temperature: 23.3°C

Communication System: CW Frequency: 5250 MHz Duty Cycle: 1:1

Probe: EX3DV4 – SN3846 ConvF(5.37,5.37,5.37)

System Validation /Area Scan (81x191x1): Interpolated grid: $dx=1.000 \text{ mm}$, $dy=1.000 \text{ mm}$

Maximum value of SAR (interpolated) = 17.92 W/kg

System Validation /Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 71.17 V/m ; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 28.76 W/kg

SAR(1 g) = 19.81 W/kg ; SAR(10 g) = 5.64 W/kg

Maximum value of SAR (measured) = 18.25 W/kg

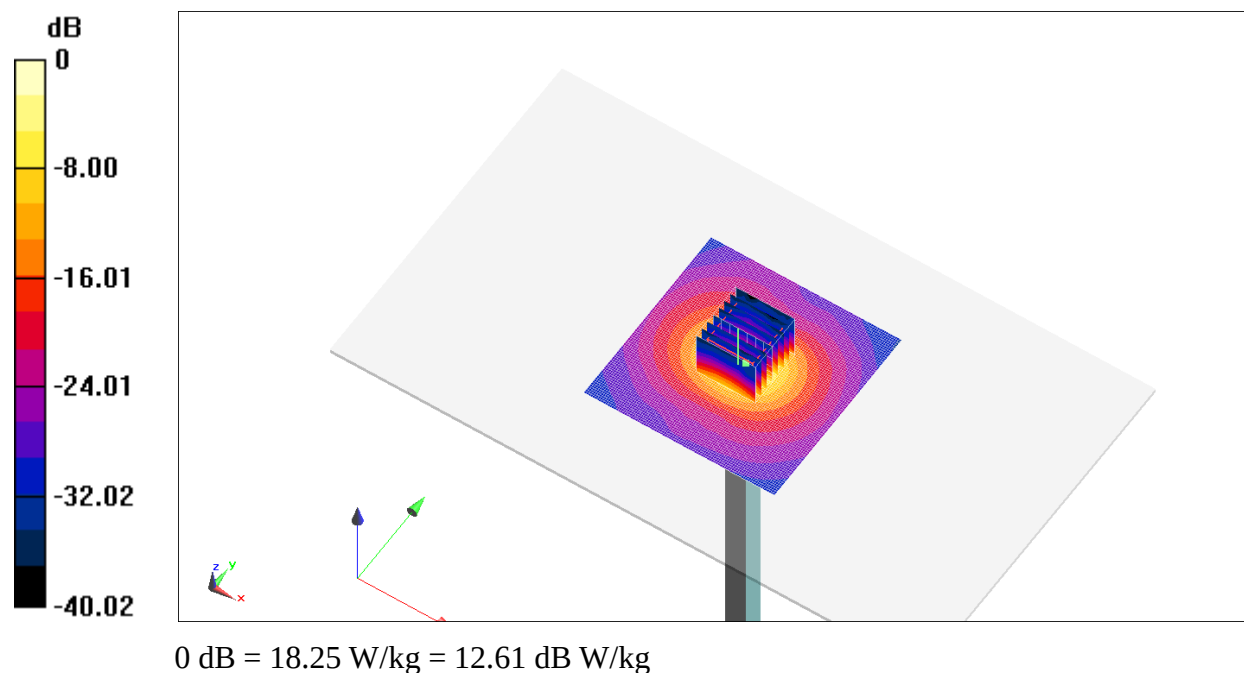


Fig.B.13validation 5250MHz 100mW

5250 MHz

Date: 4/18/2017

Electronics: DAE4 Sn1331

Medium: Body5250 MHz

Medium parameters used: $f = 5250 \text{ MHz}$; $\sigma = 5.392 \text{ mho/m}$; $\epsilon_r = 48.97$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature: 22.5°C Liquid Temperature: 23.3°C

Communication System: CW Frequency: 5250 MHz Duty Cycle: 1:1

Probe: EX3DV4 – SN3846 ConvF(4.95,4.95,4.95)

System Validation /Area Scan (81x191x1): Interpolated grid: $dx=1.000 \text{ mm}$, $dy=1.000 \text{ mm}$

Maximum value of SAR (interpolated) = 18.43 W/kg

System Validation /Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 68.28 V/m ; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 28.74 W/kg

SAR(1 g) = 18.72 W/kg ; SAR(10 g) = 5.32 W/kg

Maximum value of SAR (measured) = 18.31 W/kg

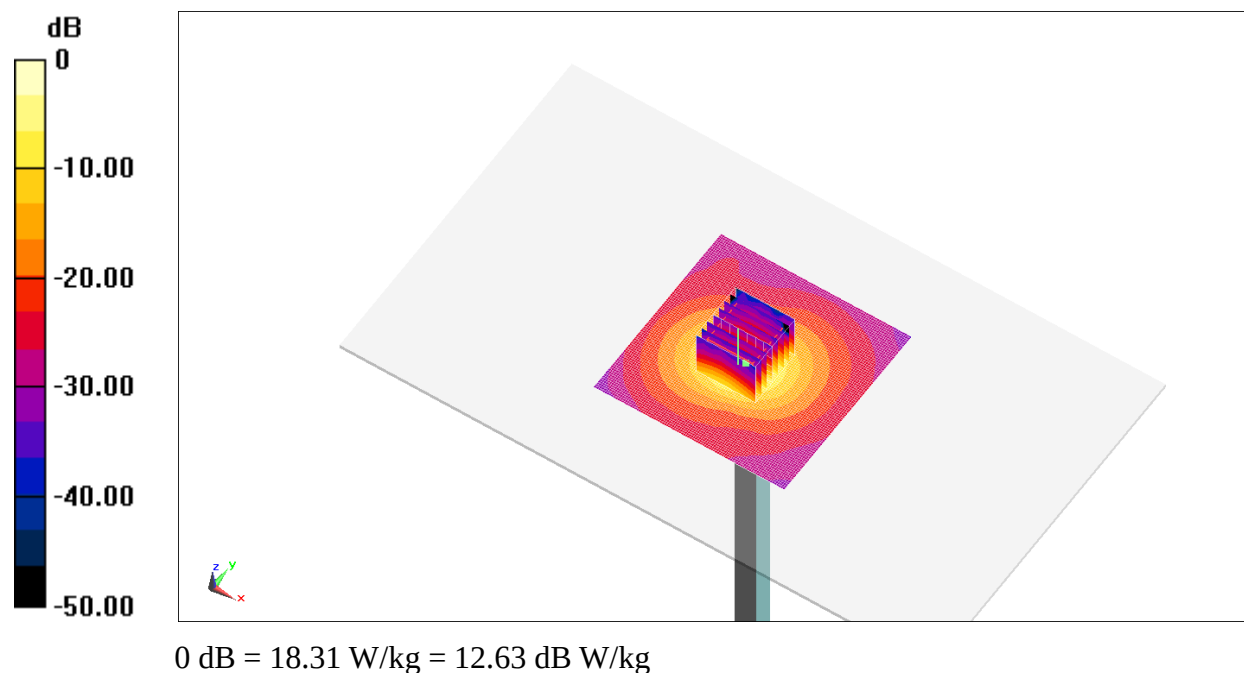


Fig.B.14validation 5250MHz 100mW

5600 MHz

Date: 4/18/2017

Electronics: DAE4 Sn1331

Medium: Head5600 MHz

Medium parameters used: $f = 5600$ MHz; $\sigma = 5.125$ mho/m; $\epsilon_r = 35.71$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.5°C Liquid Temperature: 23.3°C

Communication System: CW Frequency: 5600 MHz Duty Cycle: 1:1

Probe: EX3DV4 – SN3846 ConvF(4.72,4.72,4.72)

System Validation /Area Scan (81x191x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 18.78 W/kg

System Validation /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value =72.22 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 32.52 W/kg

SAR(1 g) = 20.39W/kg; SAR(10 g) = 5.85 W/kg

Maximum value of SAR (measured) = 18.96 W/kg

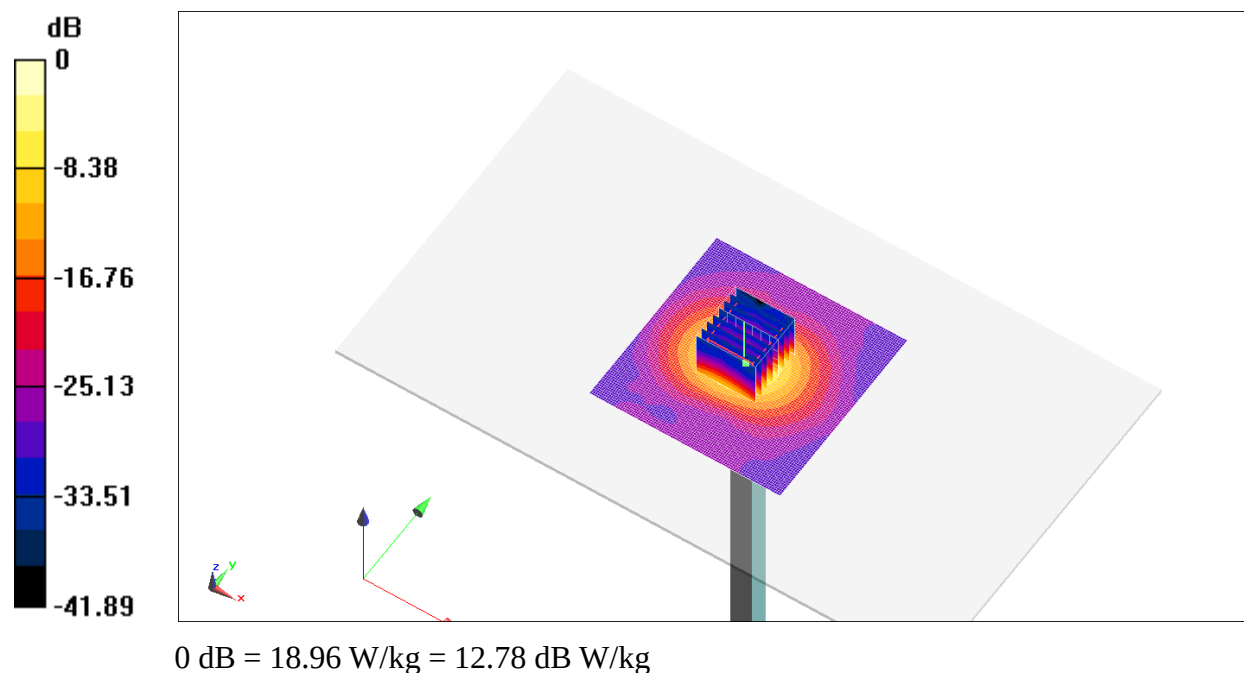


Fig.B.15validation 5600MHz 100mW

5600 MHz

Date: 4/18/2017

Electronics: DAE4 Sn1331

Medium: Body5600 MHz

Medium parameters used: $f = 5600$ MHz; $\sigma = 5.749$ mho/m; $\epsilon_r = 48.49$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.5°C Liquid Temperature: 23.3°C

Communication System: CW Frequency: 5600 MHz Duty Cycle: 1:1

Probe: EX3DV4 – SN3846 ConvF(4.18,4.18,4.18)

System Validation /Area Scan (81x191x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 18.86 W/kg

System Validation /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value =66.99 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 33.24 W/kg

SAR(1 g) = 19.44W/kg; SAR(10 g) = 5.54 W/kg

Maximum value of SAR (measured) = 19.13 W/kg

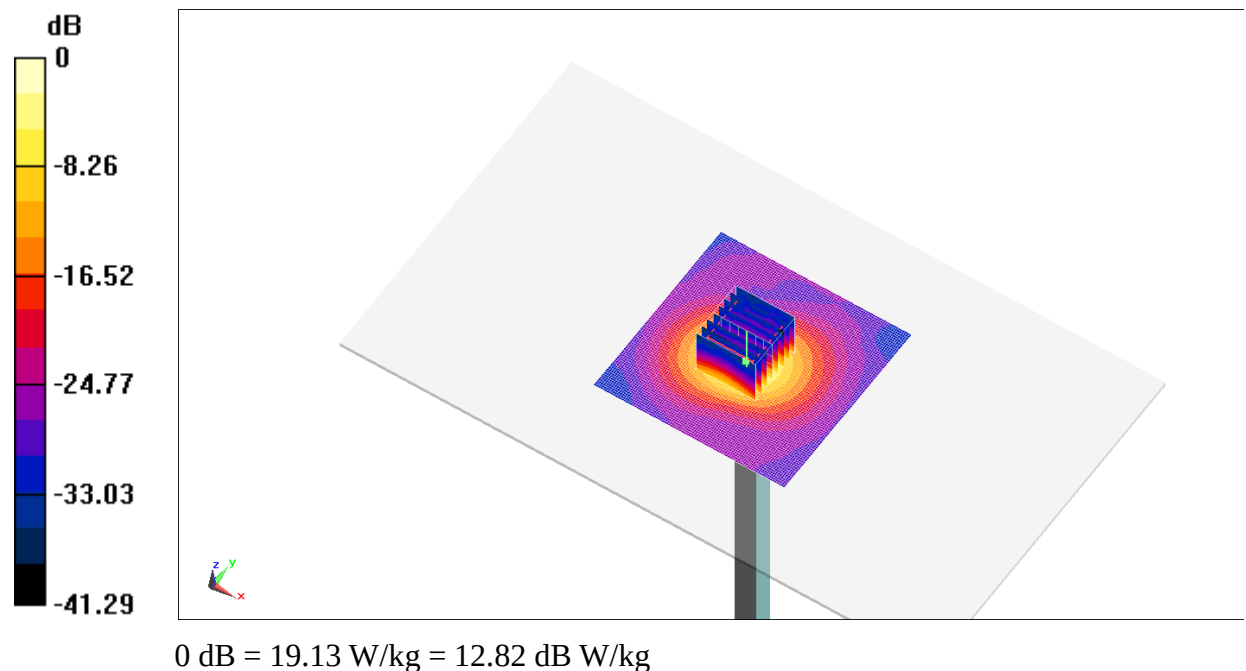


Fig.B.16validation 5600MHz 100mW

5750 MHz

Date: 4/18/2017

Electronics: DAE4 Sn1331

Medium: Head5750 MHz

Medium parameters used: $f = 5750$ MHz; $\sigma = 5.181$ mho/m; $\epsilon_r = 35.51$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.5°C Liquid Temperature: 23.3°C

Communication System: CW Frequency: 5750 MHz Duty Cycle: 1:1

Probe: EX3DV4 – SN3846 ConvF(4.95,4.95,4.95)

System Validation /Area Scan (81x191x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 19.14 W/kg

System Validation /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value =70.88 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 32.72 W/kg

SAR(1 g) = 19.96W/kg; SAR(10 g) = 5.62 W/kg

Maximum value of SAR (measured) = 19.31 W/kg

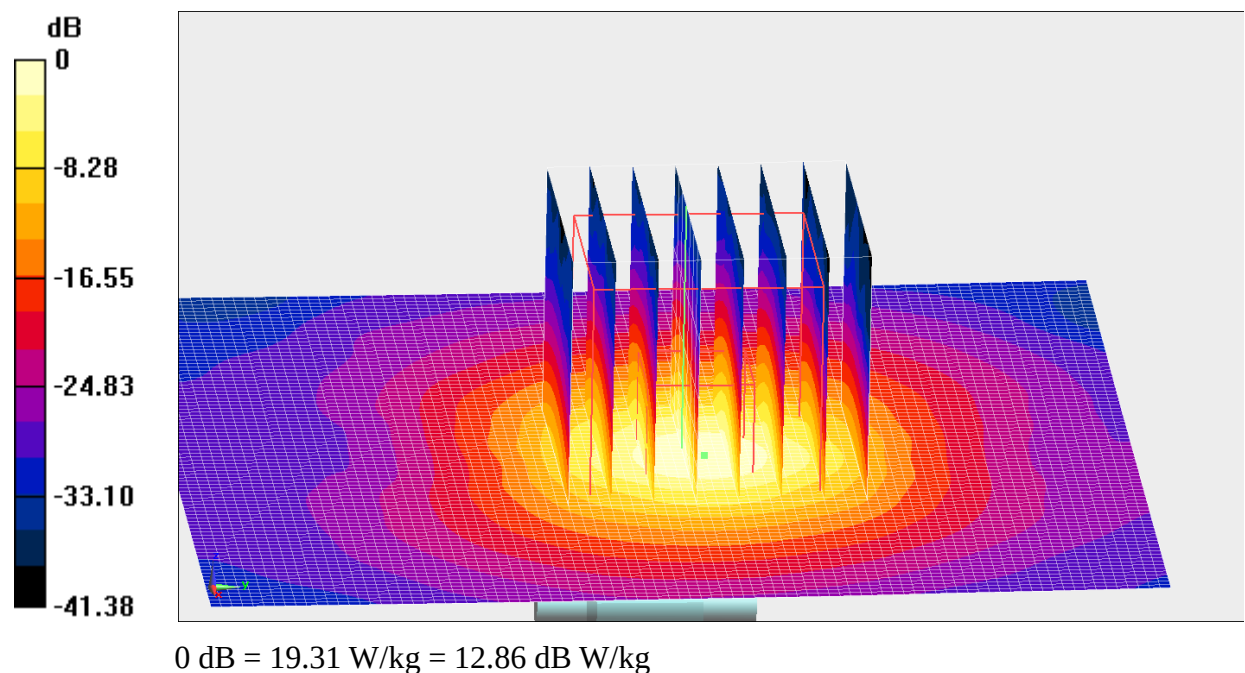


Fig.B.17validation 5750MHz 100mW

5750 MHz

Date: 4/18/2017

Electronics: DAE4 Sn1331

Medium: Body5750 MHz

Medium parameters used: $f = 5750$ MHz; $\sigma = 5.598$ mho/m; $\epsilon_r = 47.87$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.5°C Liquid Temperature: 23.3°C

Communication System: CW Frequency: 5750 MHz Duty Cycle: 1:1

Probe: EX3DV4 – SN3846 ConvF(4.53,4.53,4.53)

System Validation /Area Scan (81x191x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 18.16 W/kg

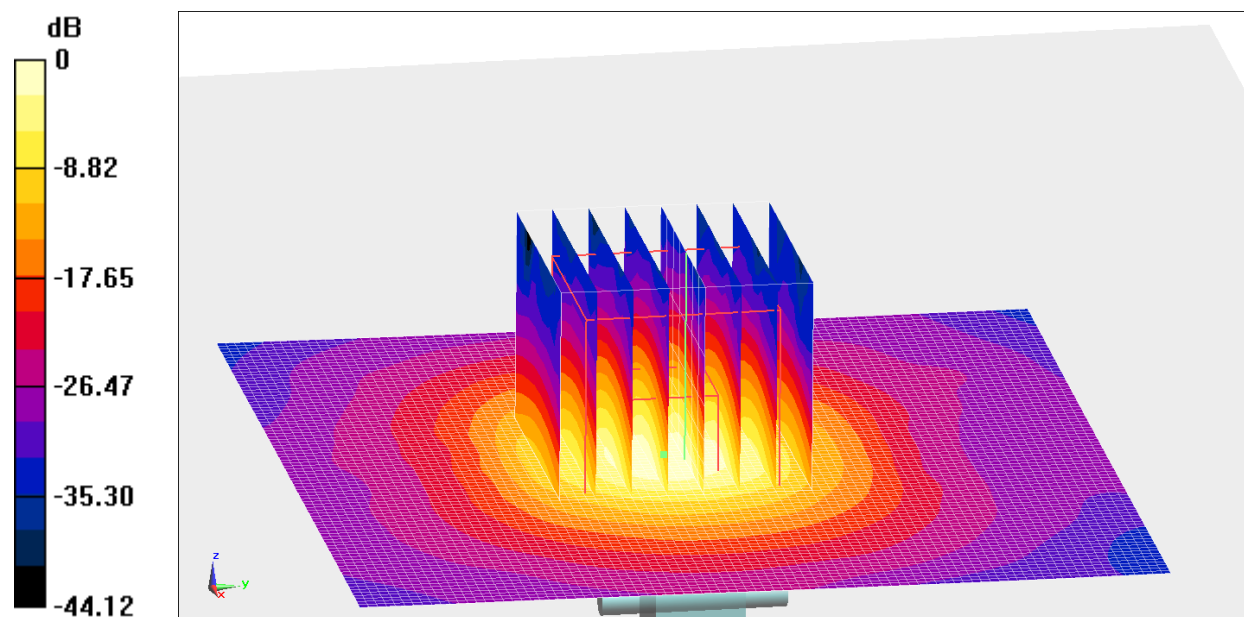
System Validation /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value =65.36 V/m; Power Drift = 0 dB

Peak SAR (extrapolated) = 32.98 W/kg

SAR(1 g) = 18.55W/kg; SAR(10 g) = 5.11 W/kg

Maximum value of SAR (measured) = 18.1 W/kg



0 dB = 18.1 W/kg = 12.58 dB W/kg

Fig.B.18validation 5750MHz 100mW

The SAR system verification must be required that the area scan estimated 1-g SAR is within 3% of the zoom scan 1-g SAR.

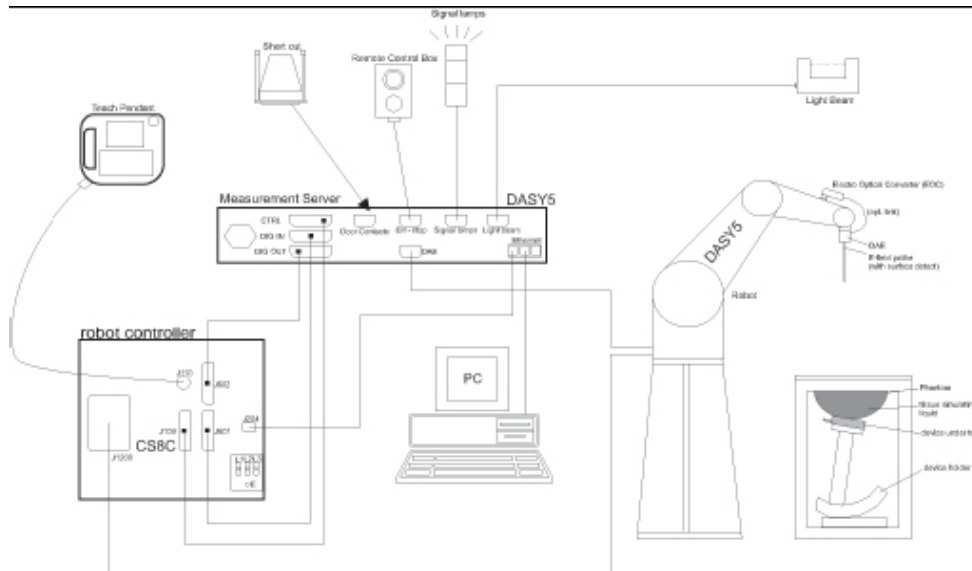
Table B.1 Comparison between area scan and zoom scan for system verification

Date	Band	Position	Area scan (1g)	Zoom scan (1g)	Drift (%)
2017-4-12	750	Head	2.05	2.08	-1.44
	750	Body	2.08	2.12	-1.89
2017-4-13	835	Head	2.36	2.39	-1.26
	835	Body	2.33	2.32	0.43
2017-4-14	1750	Head	9.08	9.06	0.22
	1750	Body	9.08	9.12	-0.44
2017-4-15	1900	Head	10.21	10.32	-1.07
	1900	Body	10.35	10.08	2.68
2017-4-16	2450	Head	13.1	13.44	-2.53
	2450	Body	13.36	13.06	2.30
2017-4-17	2600	Head	14.04	14.4	-2.50
	2600	Body	14.22	13.95	1.94

ANNEX C SAR Measurement Setup

C.1 Measurement Set-up

The Dasy4 or DASY5 system for performing compliance tests is illustrated above graphically. This system consists of the following items:



Picture C.1 SAR Lab Test Measurement Set-up

- A standard high precision 6-axis robot (Stäubli TX=RX family) with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic field probe optimized and calibrated for the targeted measurement.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running WinXP and the DASY4 or DASY5 software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- The phantom, the device holder and other accessories according to the targeted measurement.