

SAR Dipole

ISSUED BY
Shenzhen BALUN Technology Co., Ltd.



Performance Measurement Report

FOR
Validation Dipoles



Tested by:

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Approved by:

Wei Yanquan

(Chief Engineer)

Report No.: LW-SZ16C0109-701

EUT Type: SAR Validation Dipole

Model Name: D835V2, D1750V2

D1900V2, D2450V2

D2600V2, D5GHzV2

Brand Name: Speag

Test Conclusion: Pass

Test Date: Oct. 22, 2016 ~ Oct. 26, 2016

Date of Issue: Oct. 29, 2016

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1 GENERAL INFORMATION

1.1 Introduction

This document contains a summary of the requirements set forth by the IEEE 1528, FCC KDB 865664 D01 for reference dipoles used for SAR measurement system validations. Instead of the typical annual calibration recommended by measurement standards, the reference dipoles were demonstrated that the SAR target, impedance and return loss have remain stable, so the longer calibration interval is acceptable.

1.2 General Description for Equipment under Test (EUT)

EUT Type	DASY 52 Reference Dipoles
Manufacturer	Speag

Parameter	EUT 1	EUT 2	EUT 3	EUT 4	EUT 5	EUT 6
Model	D835V2	D1750V2	D1900V2	D2450V2	D2600V2	D5GHzV2
Frequency	835 MHz	1750 MHz	1900 MHz	2450 MHz	2600 MHz	5GHz-6GHz
Serial Number	SN 4d187	SN 1130	SN 5d193	SN 952	SN 1095	SN 1200
Product Condition (New/Used)	Used	Used	Used	Used	Used	Used
Last Cal. Date	2014/11/26	2014/11/28	2014/11/28	2014/11/27	2014/11/27	2014/12/4
Previous meas. Date	2015/10/25	2015/10/23	2015/10/25	2015/10/24	2015/10/24	2015/10/26
Current meas. Date	2016/10/24	2016/10/25	2016/10/22	2016/10/23	2016/10/23	2016/10/26

1.3 EUT Photos

D835V2	
	
D1750V2	
	
D1900V2	
	
D2450V2	
	

D2600V2



D5GHzV2



2 SIMULATING LIQUID VERIFICATION

Liquid Type	Fre. (MHz)	Meas. Conductivity (σ) (S/m)	Meas. Permittivity (ϵ)	Target Conductivity (σ) (S/m)	Target Permittivity (ϵ)	Conductivity Tolerance (%)	Permittivity Tolerance (%)
Head	835	0.89	41.31	0.90	41.50	-1.11	-0.46
Body	835	0.96	55.83	0.97	55.20	-1.03	1.14
Head	1750	1.38	39.86	1.37	40.10	0.73	-0.60
Body	1750	1.47	52.80	1.49	53.40	-1.34	-1.12
Head	1900	1.41	39.64	1.40	40.00	0.71	-0.90
Body	1900	1.52	51.41	1.52	53.30	0.00	-3.55
Head	2450	1.85	39.11	1.80	39.20	2.78	-0.23
Body	2450	1.96	51.07	1.95	52.70	0.51	-3.09
Head	2600	1.96	38.73	1.96	39.00	0.00	-0.69
Body	2600	2.18	50.49	2.16	52.50	0.93	-3.83
Head	5200	4.73	36.21	4.66	36.00	1.50	0.61
Body	5200	5.41	48.93	5.30	49.00	2.08	-0.16
Head	5600	4.97	34.83	5.07	35.50	-1.97	-1.97
Body	5600	5.74	47.08	5.77	48.50	-0.52	-2.87
Head	5800	5.39	34.37	5.27	35.30	2.28	-2.63
Body	5800	5.91	46.83	6.00	48.20	-1.50	-2.84



3 DIPOLE IMPEDANCE AND RETURN LOSS

The dipoles are designed to have low return loss when presented against a flat phantom at the specified distance. A Vector Network Analyser was used to perform a return loss measurement on the specific dipole when in the measurement location against the phantom and the distance was specified by the manufacturer with a special, low loss and low relative permittivity spacer.

The impedance was measured at the SMA-connector with the network analyser.

The measurement of verification with return loss should not deviate by more than 20% and minimum of 20 dB of the return loss, and the impedance (real or imaginary parts) should not deviate by more than 5 Ohms from the previous measurement using network analyzer.

Note:

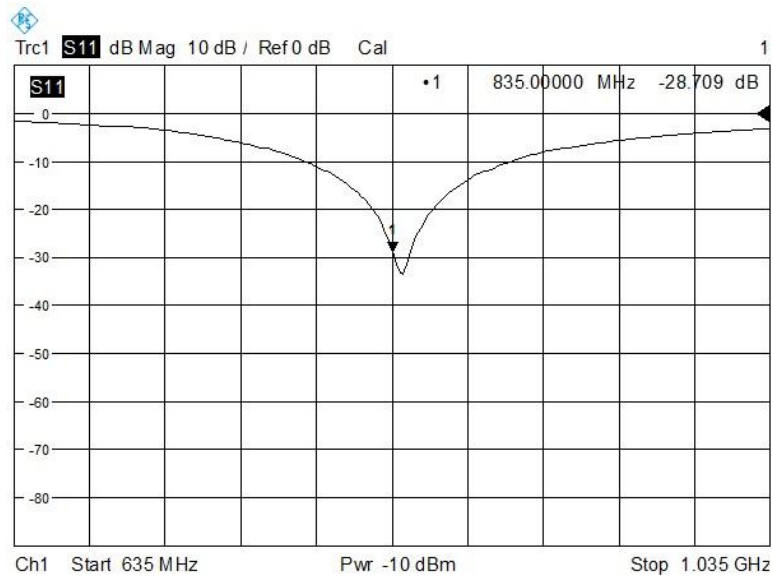
The "Previous Meas." in the following table refer to dipoles or other equivalent RF sources calibration reports.

3.1 D835V2

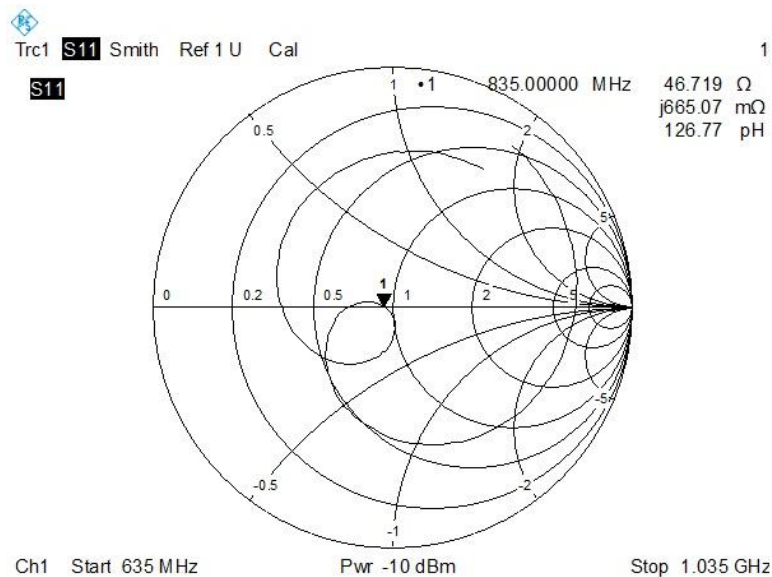
RETURN LOSS AND IMPEDANCE IN HEAD LIQUID

Meas. Results	Current Meas.	Previous Meas.	Max. Deviation
Return Loss (dB)	-28.709	-30.227	-5.0%
Impedance	46.7 Ω + 0.665 j Ω	48.0 Ω - 0.842 j Ω	1.507 Ω (Imaginary part)

Return Loss



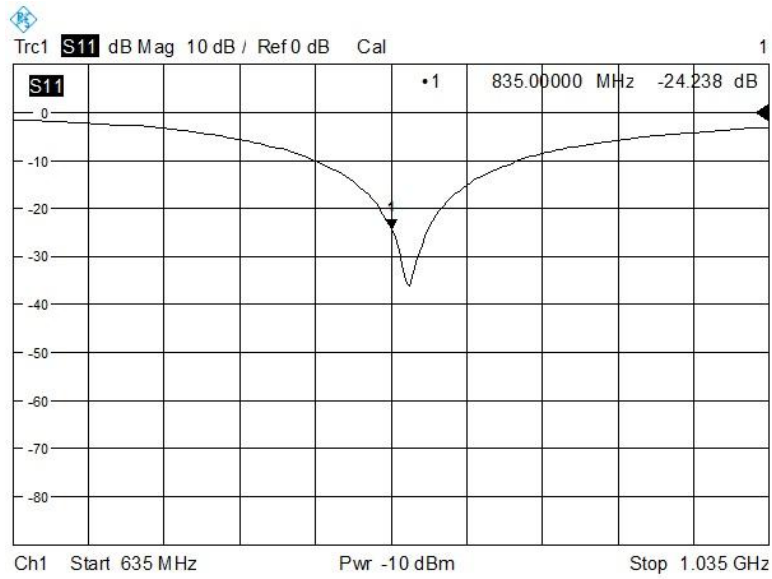
Impedance



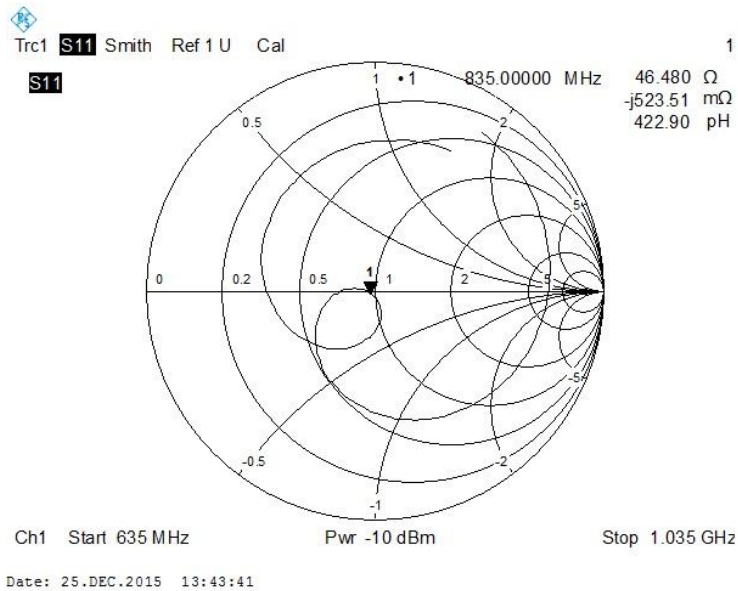
RETURN LOSS AND IMPEDANCE IN BODY LIQUID

Meas. Results	Current Meas.	Previous Meas.	Max. Deviation
Return Loss (dB)	-24.238	-24.404	-0.7%
Impedance	46.5 Ω -0.524 j Ω	46.9 Ω -0.337 j Ω	-0.4 Ω (Real part)

Return Loss



Impedance

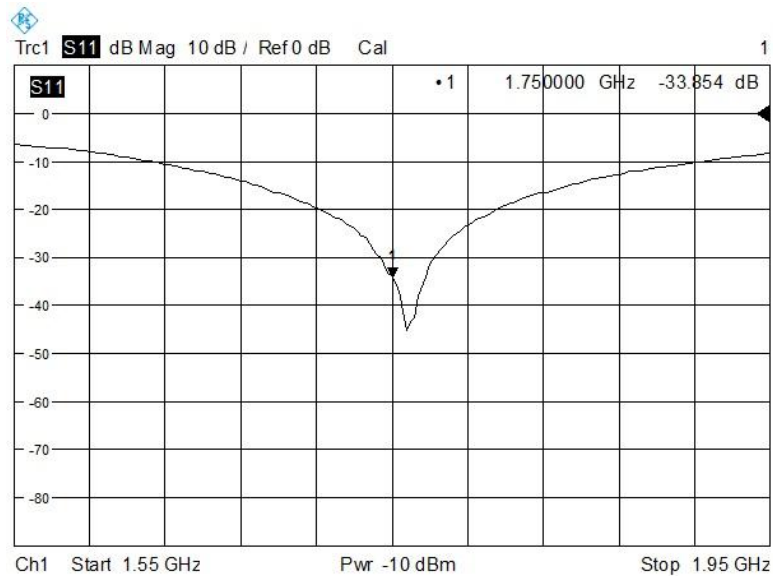


3.2 D1750V2

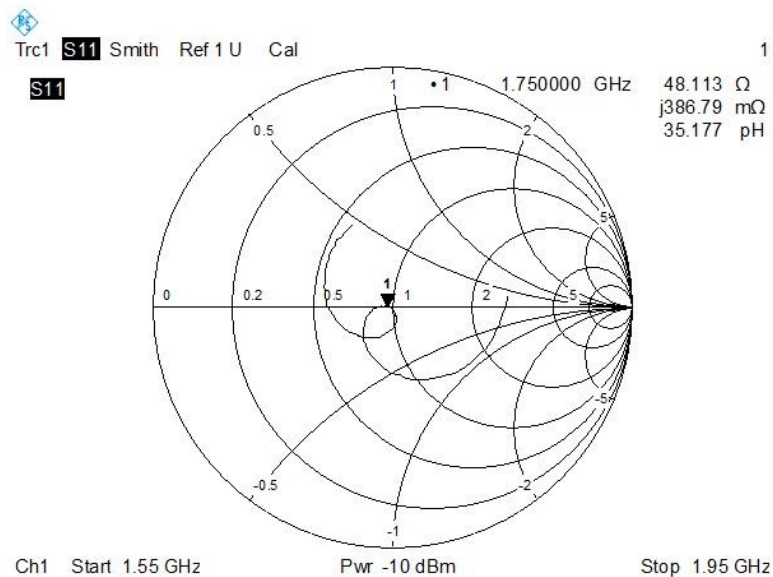
RETURN LOSS AND IMPEDANCE IN HEAD LIQUID

Meas. Results	Current Meas.	Previous Meas.	Max. Deviation
Return Loss (dB)	-33.854	-37.494	-9.7%
Impedance	48.1 Ω + 0.387 j Ω	48.8 Ω - 0.448 j Ω	0.835 Ω (Imaginary part)

Return Loss



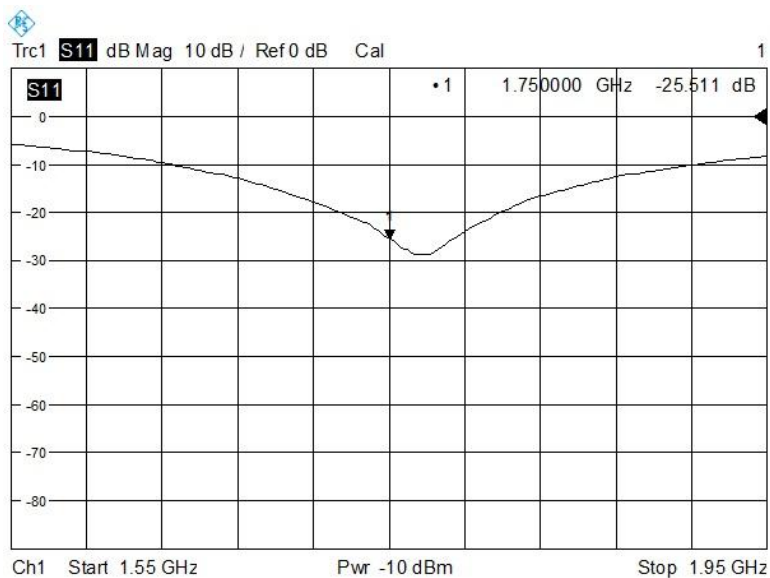
Impedance



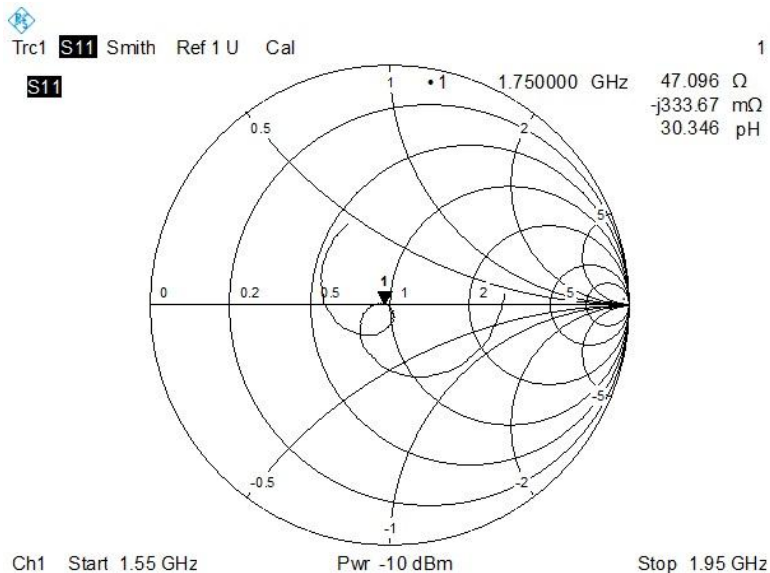
RETURN LOSS AND IMPEDANCE IN BODY LIQUID

Meas. Results	Current Meas.	Previous Meas.	Max. Deviation
Return Loss (dB)	-25.511	-25.849	-1.3%
Impedance	47.1 Ω -0.334 j Ω	48.0 Ω + 4.534 j Ω	-4.868 Ω (Imaginary part)

Return Loss



Impedance

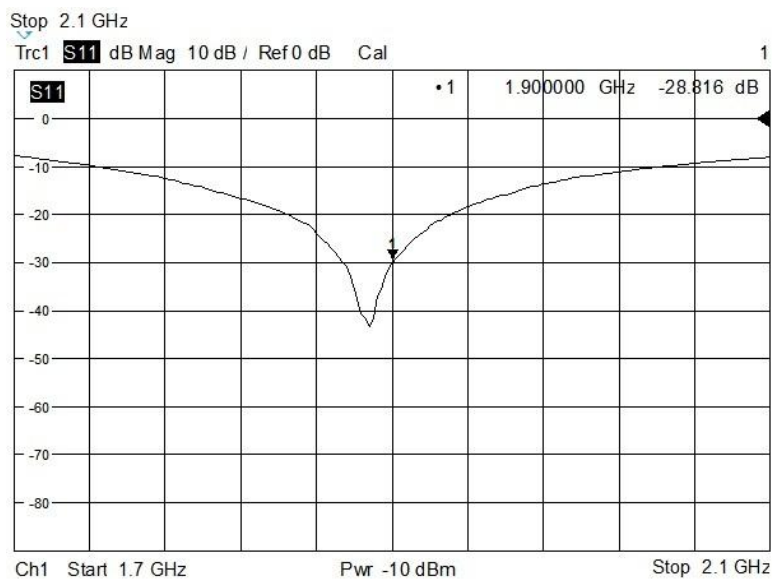


3.3 D1900V2

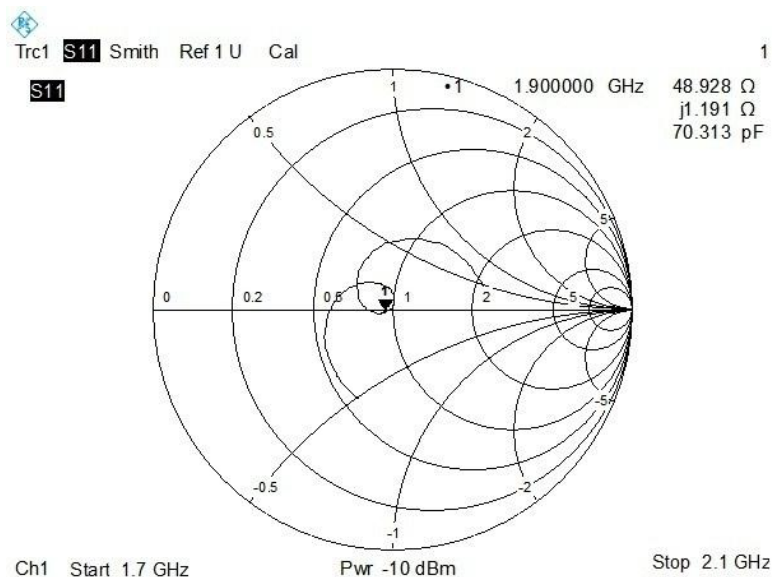
RETURN LOSS AND IMPEDANCE IN HEAD LIQUID

Meas. Results	Current Meas.	Previous Meas.	Max. Deviation
Return Loss (dB)	-28.816	-26.098	10.4%
Impedance	48.9 Ω +1.191 j Ω	49.520 Ω +2.091 j Ω	-0.900 Ω (Imaginary part)

Return Loss



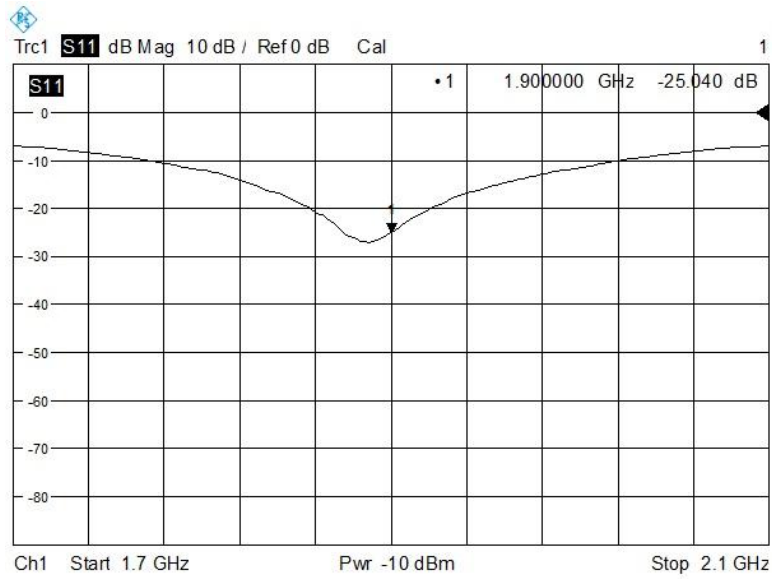
Impedance



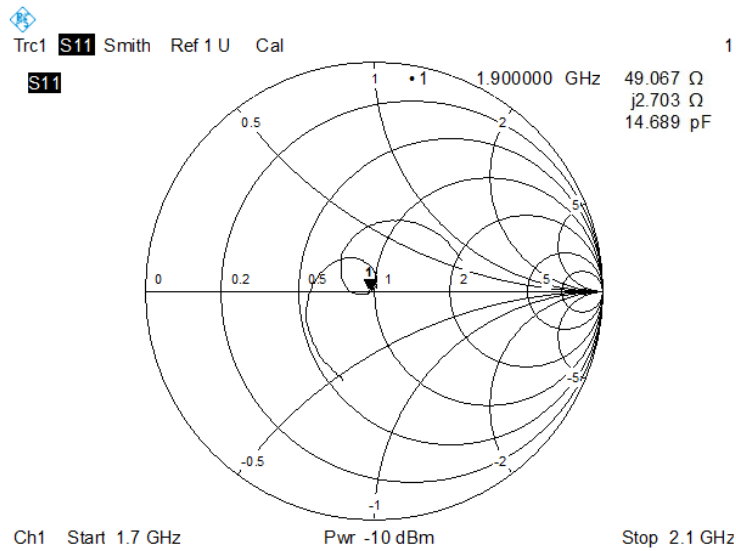
RETURN LOSS AND IMPEDANCE IN BODY LIQUID

Meas. Results	Current Meas.	Previous Meas.	Max. Deviation
Return Loss (dB)	-25.040	-25.957	-3.5%
Impedance	49.1 Ω +2.703 j Ω	48.4 Ω + 2.6 j Ω	0.700 Ω (Real part)

Return Loss



Impedance

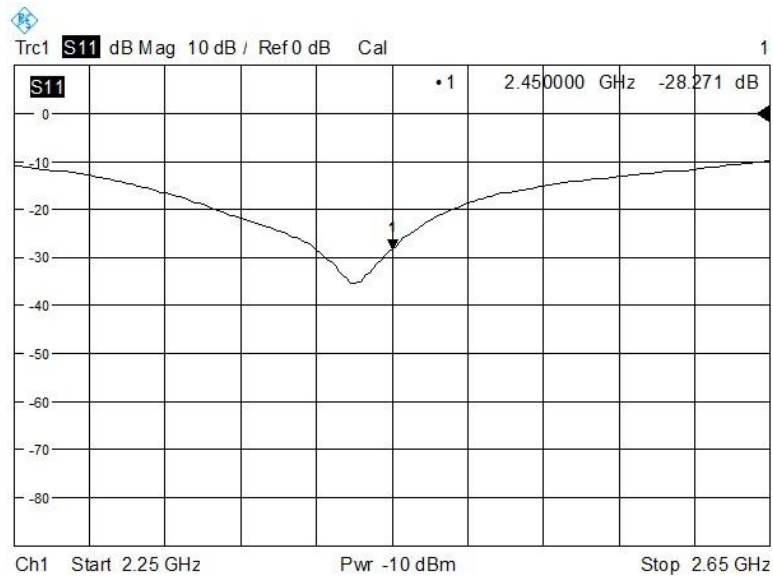


3.4 D2450V2

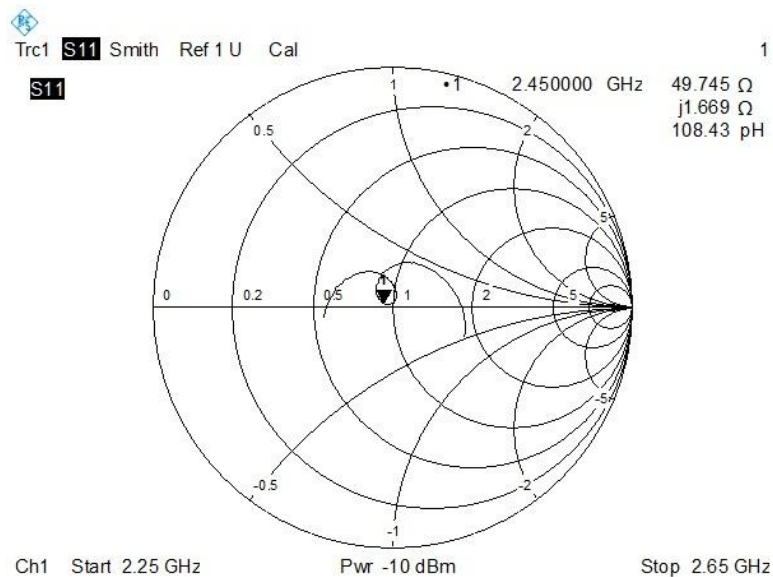
RETURN LOSS AND IMPEDANCE IN HEAD LIQUID

Meas. Results	Current Meas.	Previous Meas.	Max. Deviation
Return Loss (dB)	-28.271	-27.642	2.3%
Impedance	$49.7 \Omega + 1.669 j\Omega$	$49.5 \Omega + 1.998 j\Omega$	-0.329Ω (Imaginary part)

Return Loss



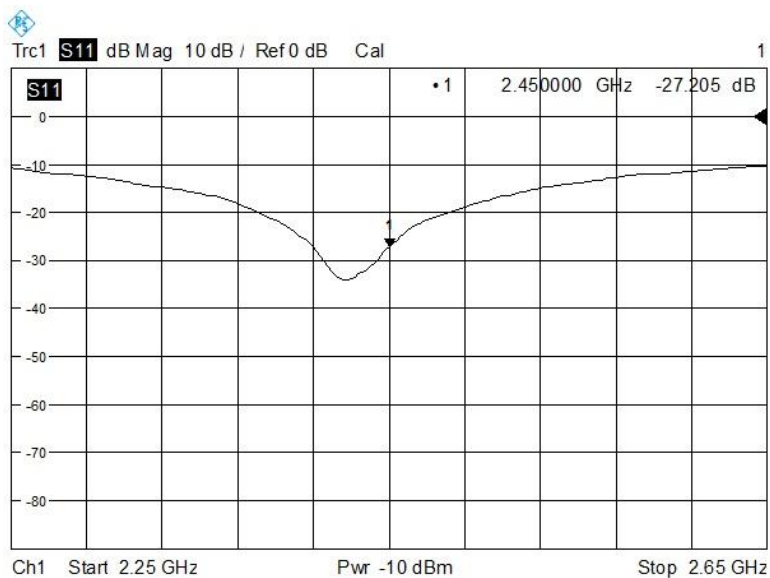
Impedance



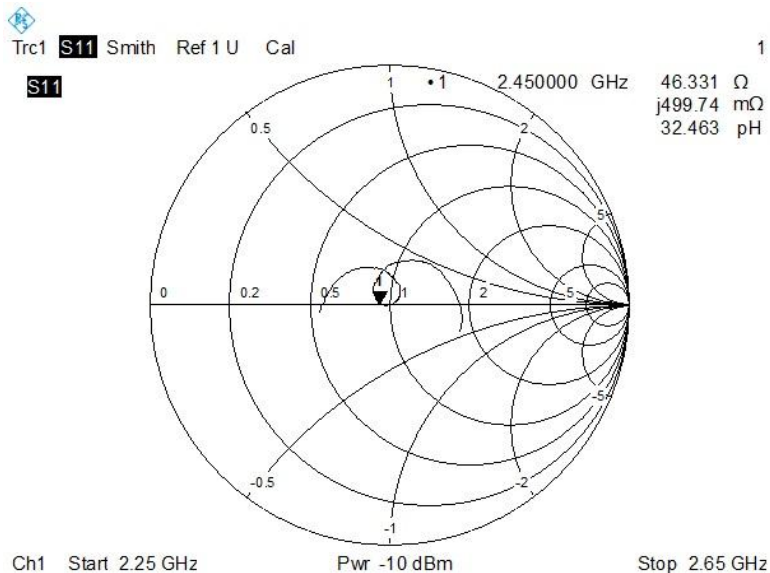
RETURN LOSS AND IMPEDANCE IN BODY LIQUID

Meas. Results	Current Meas.	Previous Meas.	Max. Deviation
Return Loss (dB)	-27.205	-27.494	-1.1%
Impedance	46.3 Ω + 0.500 j Ω	46.8 Ω + 0.699 j Ω	-0.500 Ω (Real part)

Return Loss



+Impedance

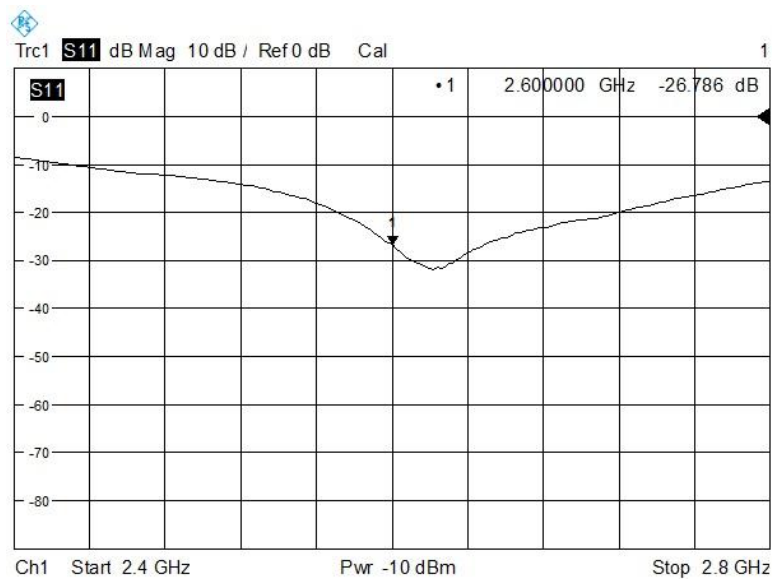


3.5 D2600V2

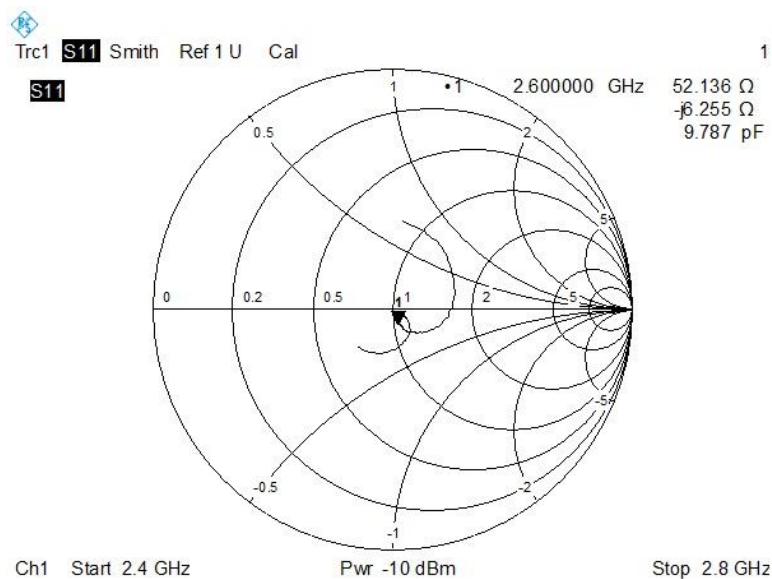
RETURN LOSS AND IMPEDANCE IN HEAD LIQUID

Meas. Results	Current Meas.	Previous Meas.	Max. Deviation
Return Loss (dB)	-26.786	-27.314	-1.9%
Impedance	52.1 Ω - 6.255 j Ω	53.3 Ω - 3.186 j Ω	-3.069 Ω (Imaginary part)

Return Loss



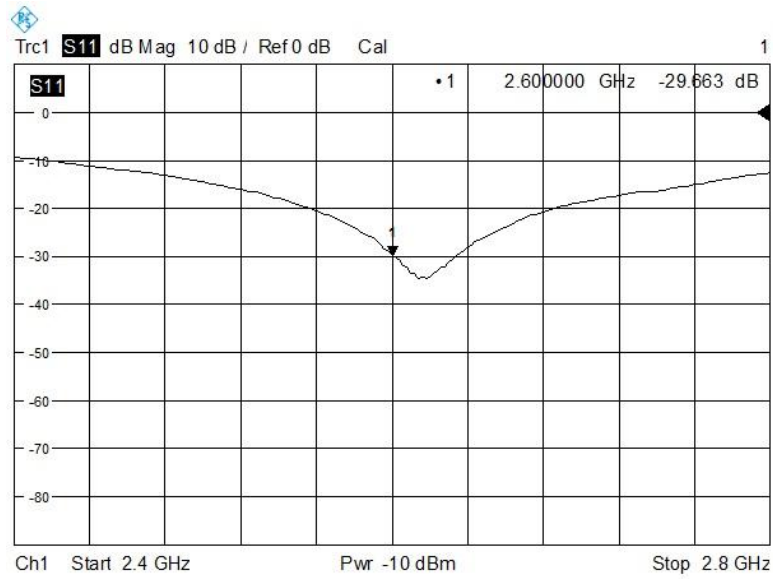
Impedance



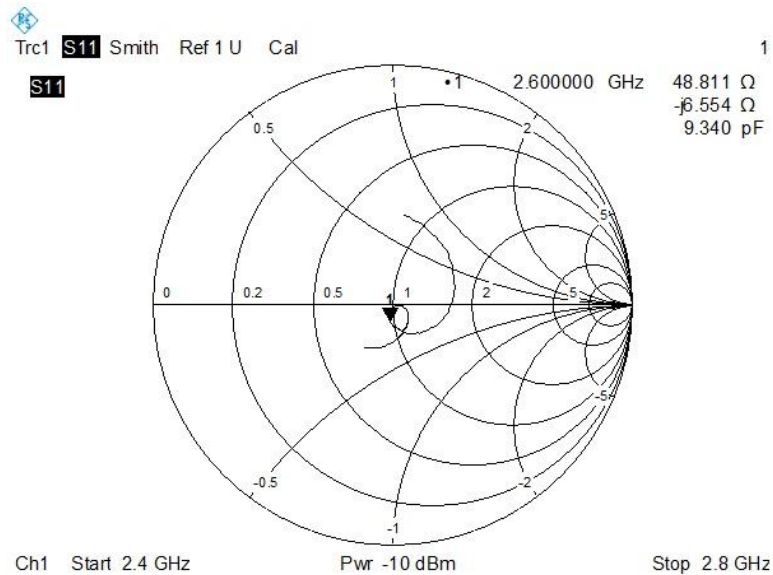
RETURN LOSS AND IMPEDANCE IN BODY LIQUID

Meas. Results	Current Meas.	Previous Meas.	Max. Deviation
Return Loss (dB)	-29.663	-30.161	-1.7%
Impedance	48.8 Ω - 6.554 j Ω	50.6 Ω - 3.015 j Ω	-3.539 Ω (Imaginary part)

Return Loss



Impedance

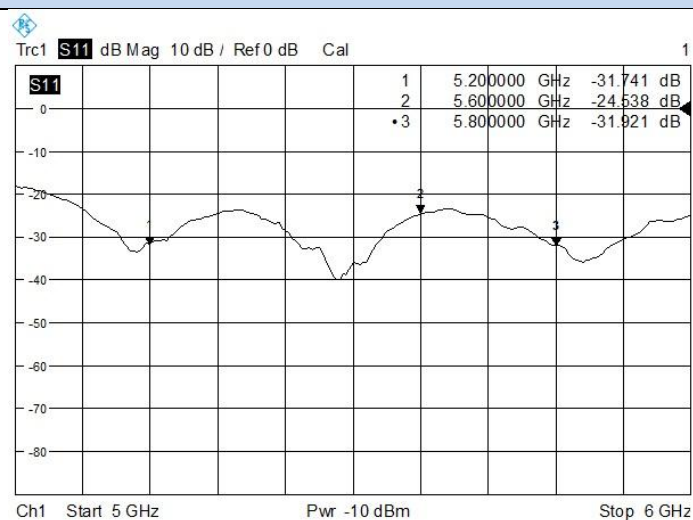


3.6 D5GHzV2

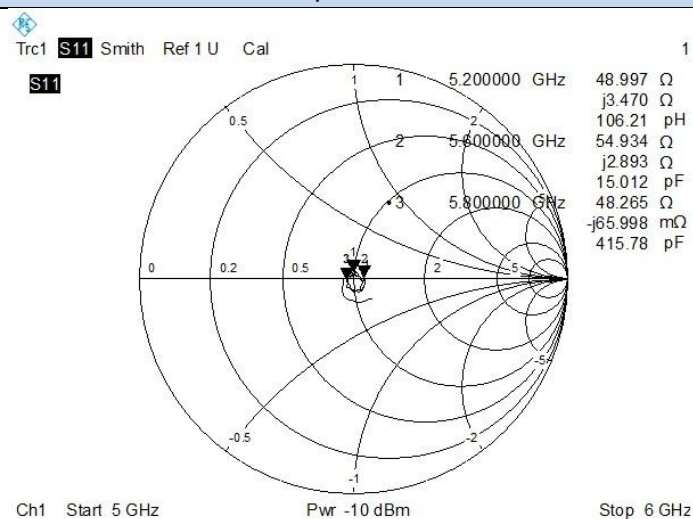
RETURN LOSS AND IMPEDANCE IN HEAD LIQUID

Meas. Results	Current Meas.	Previous Meas.	Max. Deviation
5200 MHz			
Return Loss (dB)	-31.741	-31.668	0.2%
Impedance	49.0 Ω + 3.470 j Ω	47.8 Ω + 1.415 j Ω	2.055 Ω (Imaginary part)
5600 MHz			
Return Loss (dB)	-24.538	-22.615	8.5%
Impedance	54.9 Ω + 2.893 j Ω	53.4 Ω + 2.757 j Ω	1.500 Ω (Real part)
5800 MHz			
Return Loss (dB)	-31.921	-29.503	8.2%
Impedance	48.3 Ω - 0.066 j Ω	51.1 Ω + 3.189 j Ω	-3.255 Ω (Imaginary part)

Return Loss



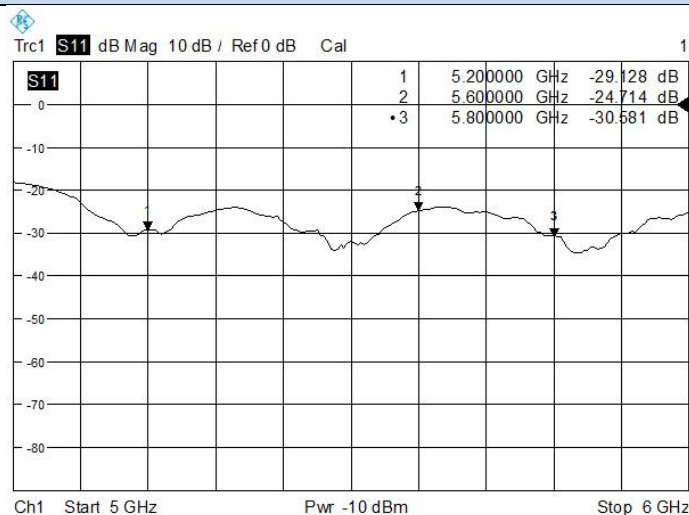
Impedance



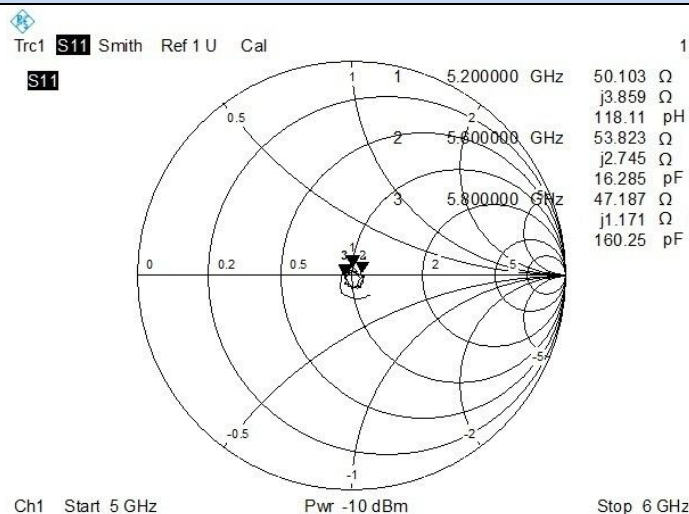
RETURN LOSS AND IMPEDANCE IN BODY LIQUID

Meas. Results	Current Meas.	Previous Meas.	Max. Deviation
5200 MHz			
Return Loss (dB)	-29.128	-30.037	-3.0%
Impedance	50.1 Ω + 3.859 j Ω	47.2 Ω + 1.088 j Ω	2.9 Ω (Real part)
5600 MHz			
Return Loss (dB)	-24.714	-21.932	12.7%
Impedance	53.8 Ω + 2.745 j Ω	52.0 Ω + 2.425 j Ω	1.8 Ω (Real part)
5800 MHz			
Return Loss (dB)	-30.581	-28.420	7.6%
Impedance	47.2 Ω + 1.171 j Ω	51.6 Ω + 3.436 j Ω	-4.4 Ω (Real part)

Return Loss

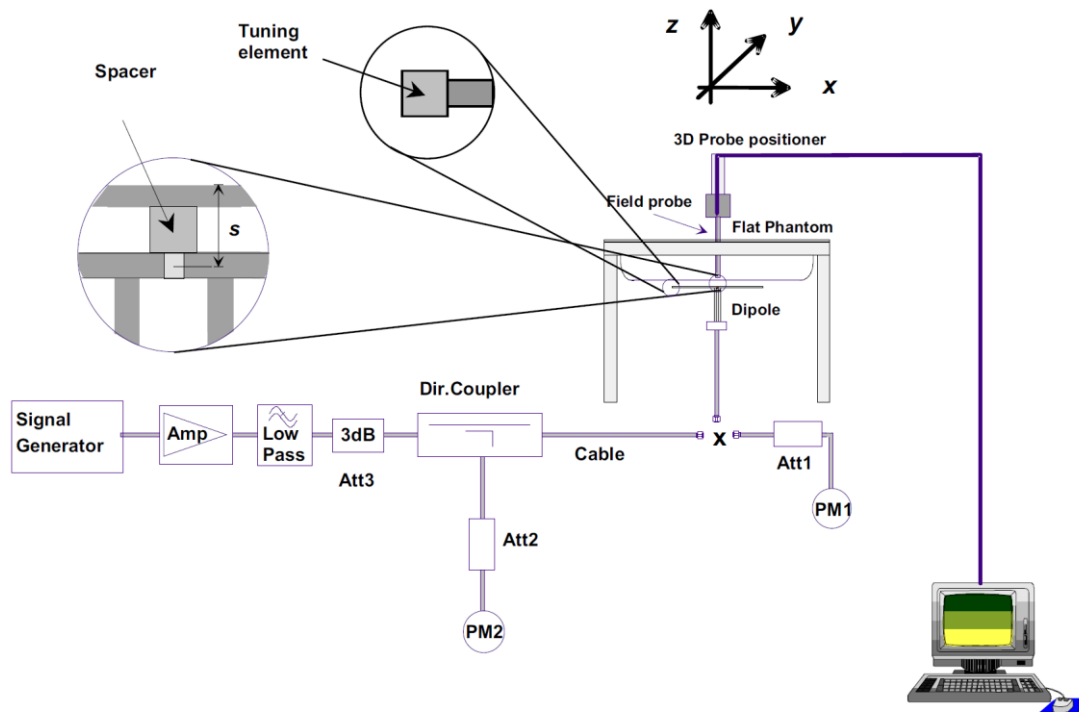


Impedance



4 VALIDATION MEASUREMENT

The IEEE Std. 1528, FCC KDBs and CEI/IEC 62209 standards state that the system validation measurements must be performed using a reference dipole meeting the fore mentioned return loss and mechanical dimension requirements. The validation measurement must be performed against a liquid filled flat phantom, with the phantom constructed as outlined in the fore mentioned standards. Per the standards, the dipole shall be positioned below the bottom of the phantom, with the dipole length centered and parallel to the longest dimension of the flat phantom, with the top surface of the dipole at the described distance from the bottom surface of the phantom.



4.1 Dipole SAR Validation Measurement Result

Freq. (MHz)	Liquid Type	Power (mW)	1 g Measured SAR (W/kg)	Normaliz ed SAR (W/kg)	10 g Measured SAR (W/kg)	Normaliz ed SAR (W/kg)	1 g Targeted SAR (W/kg)	Tolerance (%)	10 g Targeted SAR (W/kg)	Tolerance (%)
835	Head	100	0.962	9.62	0.631	6.31	9.56	0.63	6.22	1.45
	Body	100	0.973	9.73	0.656	6.56	9.56	1.78	6.22	5.47
1750	Head	100	3.390	33.90	1.790	17.90	36.40	-6.87	19.30	-7.25
	Body	100	3.470	34.70	1.880	18.80	36.40	-4.67	19.30	-2.59
1900	Head	100	3.930	39.30	1.990	19.90	39.70	-1.01	20.50	-2.93
	Body	100	4.140	41.40	2.170	21.70	39.70	4.28	20.50	5.85
2450	Head	100	5.470	54.70	2.440	24.40	52.40	4.39	24.00	1.67
	Body	100	5.380	53.80	2.410	24.10	52.40	2.67	24.00	0.42
2600	Head	100	5.290	52.90	2.330	23.30	55.30	-4.34	24.60	-5.28
	Body	100	5.270	52.70	2.380	23.80	55.30	-4.70	24.60	-3.25
5200	Head	100	8.030	80.30	2.110	21.10	76.50	4.97	21.60	-2.31
	Body	100	8.140	81.40	2.300	23.00	76.50	6.41	21.60	6.48
5600	Head	100	8.170	81.70	2.230	22.30	83.30	-1.92	23.40	-4.70
	Body	100	8.360	83.60	2.240	22.40	83.30	0.36	23.40	-4.27
5800	Head	100	7.390	73.90	2.090	20.90	78.00	-5.26	21.90	-4.57
	Body	100	8.080	80.80	2.210	22.10	78.00	3.59	21.90	0.91

4.2 D835V2

4.2.1 Dipole 835 MHz Validation Measurement for Head Tissue

Dipole 835 MHz; Type: D835V2; Serial: D835V2-SN: 4d187

Date/Time: 10/24/2016

Communication System Band: D835 (835.0 MHz); Frequency: 835 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 0.89 \text{ S/m}$; $\epsilon_r = 41.31$ $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Ambient Temperature: 22.3 Liquid Temperature: 21.2

DASY5 Configuration:

- Probe: EX3DV4 - SN7340; ConvF(9.56, 9.56, 9.56);
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1454;
- Phantom: SAM (30deg probe tilt) with CRP v5.0 Right 1857; Type: QD000P40CD; Serial: TP1857
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

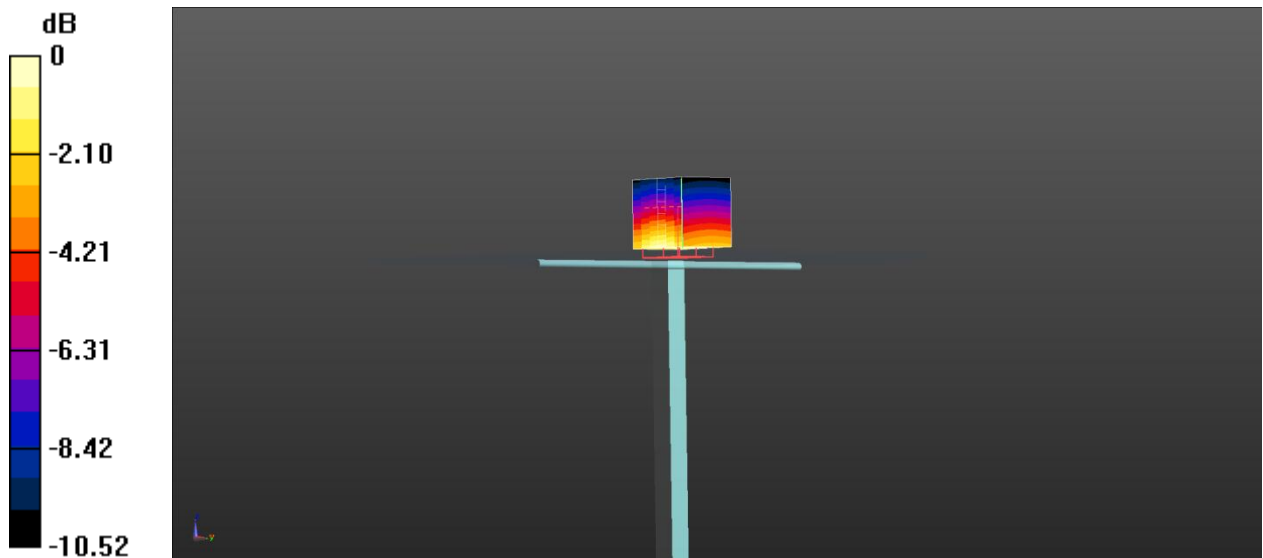
Dipole validation measurement for Head Tissue/Pin= 100mW , d=15mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 32.37 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 1.46 W/kg

SAR(1 g) = 0.962 W/kg; SAR(10 g) = 0.631 W/kg

Maximum value of SAR (measured) = 1.04 W/kg



0 dB = 1.04 W/kg = 0.17 dBW/kg

4.2.2 Dipole 835 MHz Validation Measurement for Body Tissue

Dipole 835 MHz; Type: D835V2; Serial: D835V2-SN: 4d187

Date/Time: 10/24/2016

Communication System Band: D835 (835.0 MHz); Frequency: 835 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 0.96 \text{ S/m}$; $\epsilon_r = 55.83$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Ambient Temperature: 22.3 Liquid Temperature: 21.2

DASY5 Configuration:

- Probe: EX3DV4 - SN7340; ConvF(9.83, 9.83, 9.83);
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1454;
- Phantom: SAM (30deg probe tilt) with CRP v5.0 on Right 1857; Type: QD000P40CD; Serial: TP1857
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Dipole validation measurement for Body Tissue/Pin= 100mW , d=15mm /Zoom

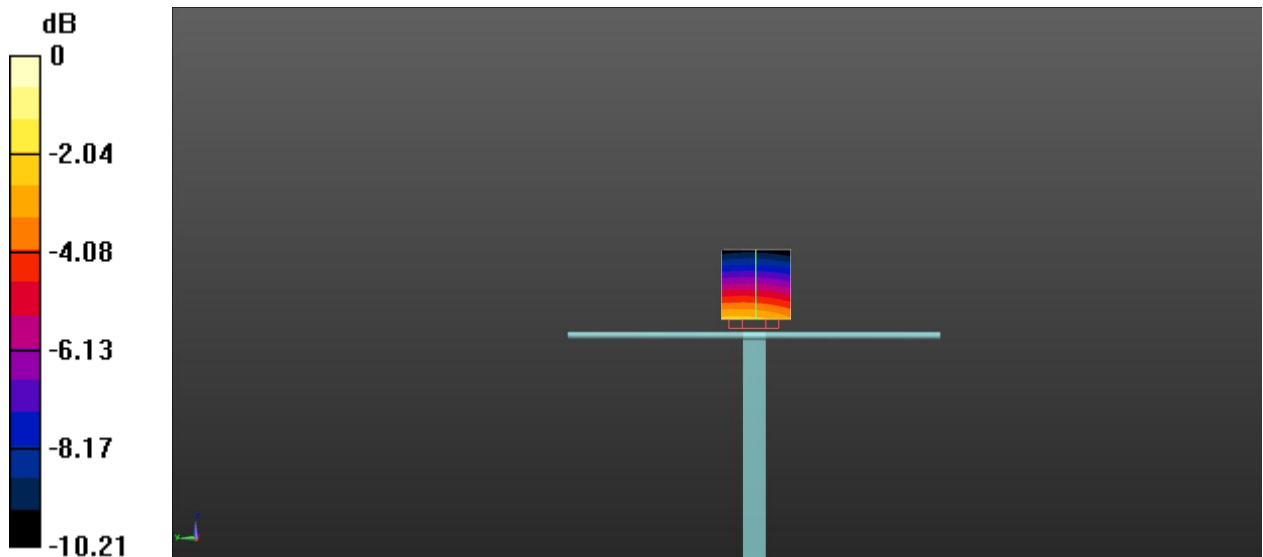
Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 31.52 V/m; Power Drift = -0.07 dB

Peak SAR (extrapolated) = 1.48 W/kg

SAR(1 g) = 0.973 W/kg; SAR(10 g) = 0.656 W/kg

Maximum value of SAR (measured) = 1.01 W/kg



0 dB = 1.01 W/kg = 0.04 dBW/kg

4.3D1750V2

4.3.1 Dipole 1750 MHz Validation Measurement for Head Tissue

Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2-SN: 1130

Date/Time: 10/25/2016

Communication System Band: D1750 (1750.0 MHz); Frequency: 1750 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 1750$ MHz; $\sigma = 1.38$ S/m; $\epsilon_r = 39.86$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Ambient Temperature: 22.4 Liquid Temperature: 21.2

DASY5 Configuration:

- Probe: EX3DV4 - SN7340; ConvF(8.22,8.22,8.22)
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1454;
- Phantom: SAM (30deg probe tilt) with CRP v5.0 on left 1859; Type: QD000P40CD; Serial: TP:1859
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

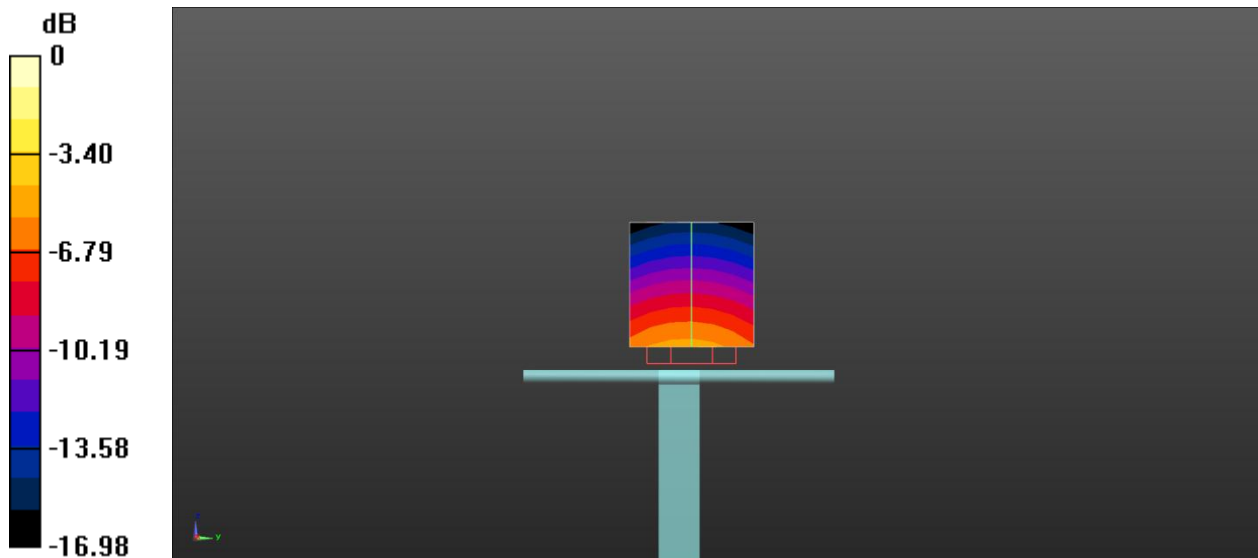
Dipole validation measurement for Head Tissue/Pin= 100mW ,d=10mm /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 42.36 V/m; Power Drift = -0.09 dB

Peak SAR (extrapolated) = 6.37 W/kg

SAR(1 g) = 3.39W/kg; SAR(10 g) = 1.79 W/kg

Maximum value of SAR (measured) = 3.79 W/kg



0 dB = 3.79 W/kg = 5.79 dBW/kg

4.3.2 Dipole 1750 MHz Validation Measurement for Body Tissue

Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2-SN: 1130

Date/Time: 10/25/2016

Communication System Band: D1750 (1750.0 MHz); Frequency: 1750 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 1750$ MHz; $\sigma = 1.47$ S/m; $\epsilon_r = 52.80$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Ambient Temperature: 22.4 Liquid Temperature: 21.2

DASY5 Configuration:

- Probe: EX3DV4 - SN7340; ConvF(7.87, 7.87, 7.87);
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1454;
- Phantom: SAM (30deg probe tilt) with CRP v5.0 on left 1859; Type: QD000P40CD; Serial: TP:1859
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Dipole validation measurement for Body Tissue/Pin= 100mW ,d=10mm /Zoom

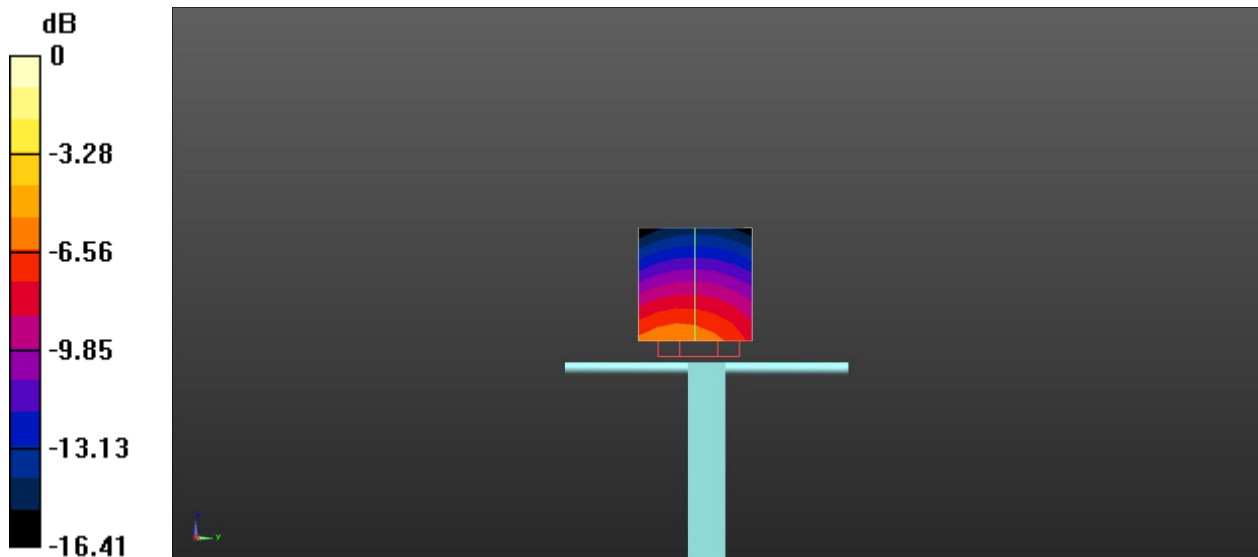
Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 41.31 V/m; Power Drift = -0.10 dB

Peak SAR (extrapolated) = 6.37 W/kg

SAR(1 g) = 3.47 W/kg; SAR(10 g) = 1.88 W/kg

Maximum value of SAR (measured) = 4.06 W/kg



0 dB = 4.06 W/kg = 6.09 dBW/kg

4.4D1900V2

4.4.1 Dipole 1900 MHz Validation Measurement for Head Tissue

Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2-SN: 5d193

Date/Time: 10/22/2016

Communication System Band: D1900 (1900.0 MHz); Frequency: 1900 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.41$ S/m; $\epsilon_r = 39.64$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Ambient Temperature: 22.4 Liquid Temperature: 21.4

DASY5 Configuration:

- Probe: EX3DV4 - SN7340; ConvF(8.15, 8.15, 8.15);
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1454;
- Phantom: SAM (30deg probe tilt) with CRP v5.0 on left 1859; Type: QD000P40CD; Serial: TP:1859
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

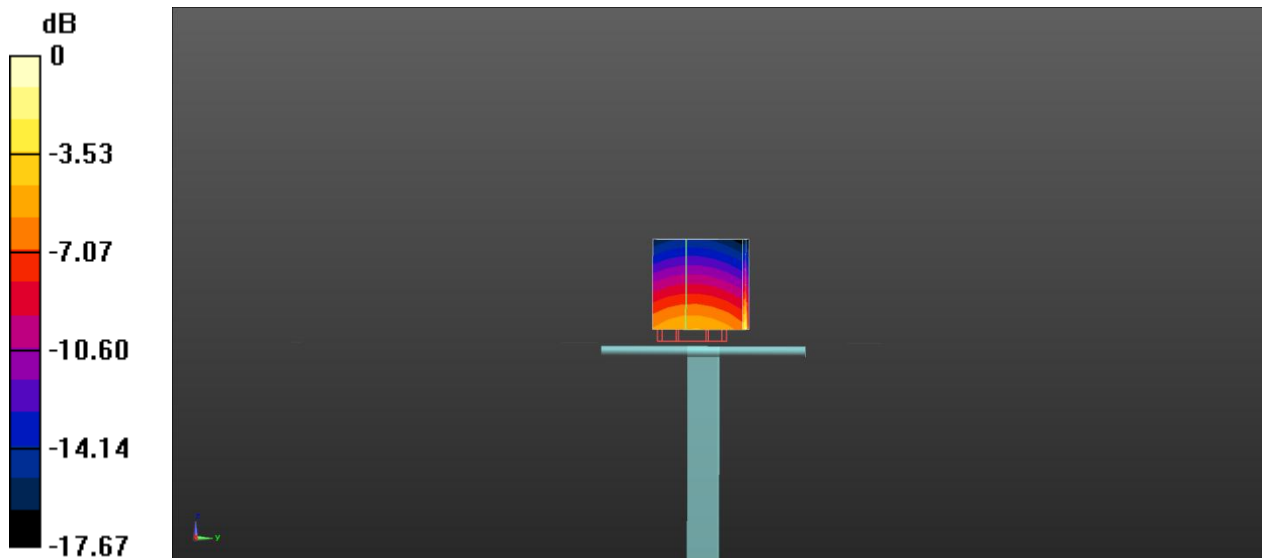
Dipole validation measurement for Head Tissue/Pin= 100mW ,d=10mm /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 50.27 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 6.92 W/kg

SAR(1 g) = 3.93 W/kg; SAR(10 g) = 1.99 W/kg

Maximum value of SAR (measured) = 4.25 W/kg



0 dB = 4.25 W/kg = 6.28 dBW/kg

4.4.2 Dipole 1900 MHz Validation Measurement for Body Tissue

Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2-SN: 5d193

Date/Time: 10/22/2016

Communication System Band: D1900 (1900.0 MHz); Frequency: 1900 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.52$ S/m; $\epsilon_r = 51.41$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Ambient Temperature: 22.4 Liquid Temperature: 21.4

DASY5 Configuration:

- Probe: EX3DV4 - SN7340; ConvF(7.51, 7.51, 7.51);
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1454;
- Phantom: SAM (30deg probe tilt) with CRP v5.0 Right 1857; Type: QD000P40CD; Serial: TP1857
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Dipole validation measurement for Body Tissue/Pin= 100mW ,d=10mm /Zoom

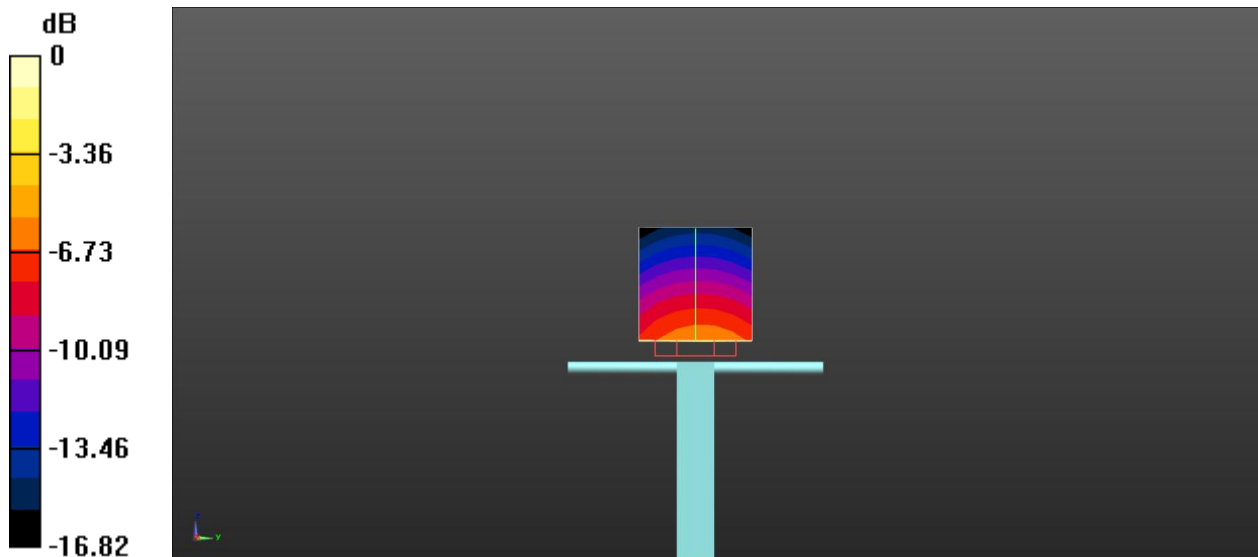
Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 51.37 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 7.58 W/kg

SAR(1 g) = 4.14 W/kg; SAR(10 g) = 2.17 W/kg

Maximum value of SAR (measured) = 4.63 W/kg



0 dB = 4.63 W/kg = 6.66 dBW/kg

4.5D2450V2

4.5.1 Dipole 2450 MHz Validation Measurement for Head Tissue

Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2-SN: 952

Date/Time: 10/23/2016

Communication System Band: CD2450 (2450.0 MHz); Frequency: 2450 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 2450$ MHz; $\sigma = 1.85$ S/m; $\epsilon_r = 39.11$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Ambient Temperature: 22.3 Liquid Temperature: 21.0

DASY5 Configuration:

- Probe: EX3DV4 - SN7340; ConvF(7.62, 7.62, 7.62);
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1454;
- Phantom: SAM (30deg probe tilt) with CRP v5.0 Right 1857; Type: QD000P40CD; Serial: TP1857
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

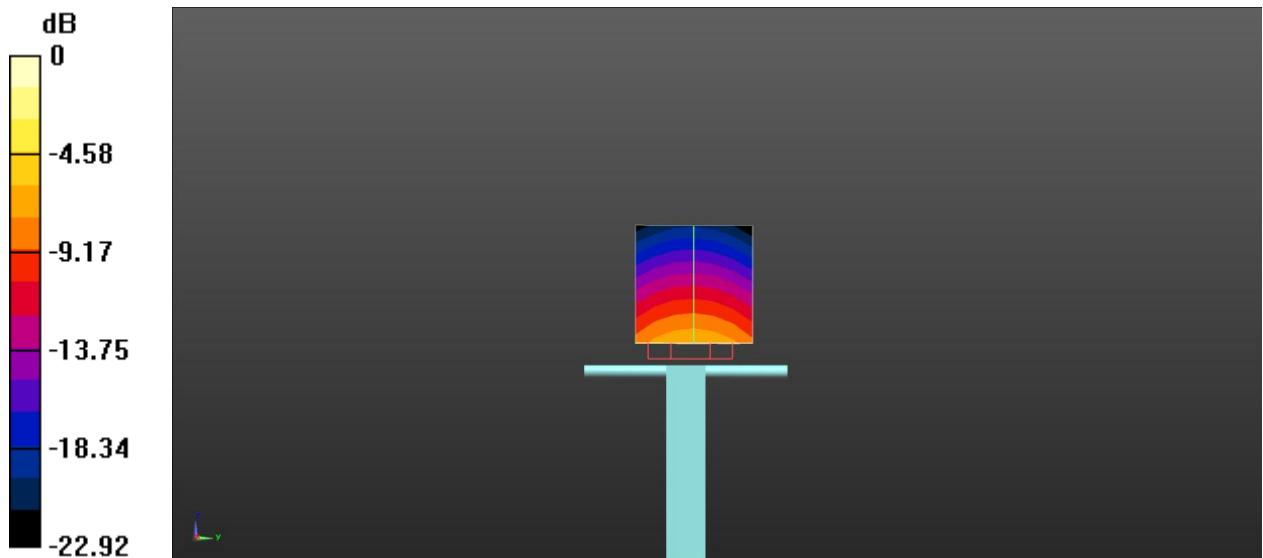
Dipole validation measurement for Head Tissue/Pin= 100mW ,d=10mm /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 55.13 V/m; Power Drift = 0.14 dB

Peak SAR (extrapolated) = 11.9 W/kg

SAR(1 g) = 5.47 W/kg; SAR(10 g) = 2.44 W/kg

Maximum value of SAR (measured) = 6.26 W/kg



0 dB = 6.26 W/kg = 7.97 dBW/kg

4.5.2 Dipole 2450 MHz Validation Measurement for Body Tissue

Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2-SN: 952

Date/Time: 10/23/2016

Communication System Band: D2450 (2450.0 MHz); Frequency: 2450 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 2450$ MHz; $\sigma = 1.96$ S/m; $\epsilon_r = 51.07$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Ambient Temperature: 22.3 Liquid Temperature: 21.0

DASY5 Configuration:

- Probe: EX3DV4 - SN7340; ConvF(7.38, 7.38, 7.38);
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1454;
- Phantom: SAM (30deg probe tilt) with CRP v5.0 Right 1857; Type: QD000P40CD; Serial: TP1857
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Dipole validation measurement for Body Tissue/Pin= 100mW ,d=10mm /Zoom

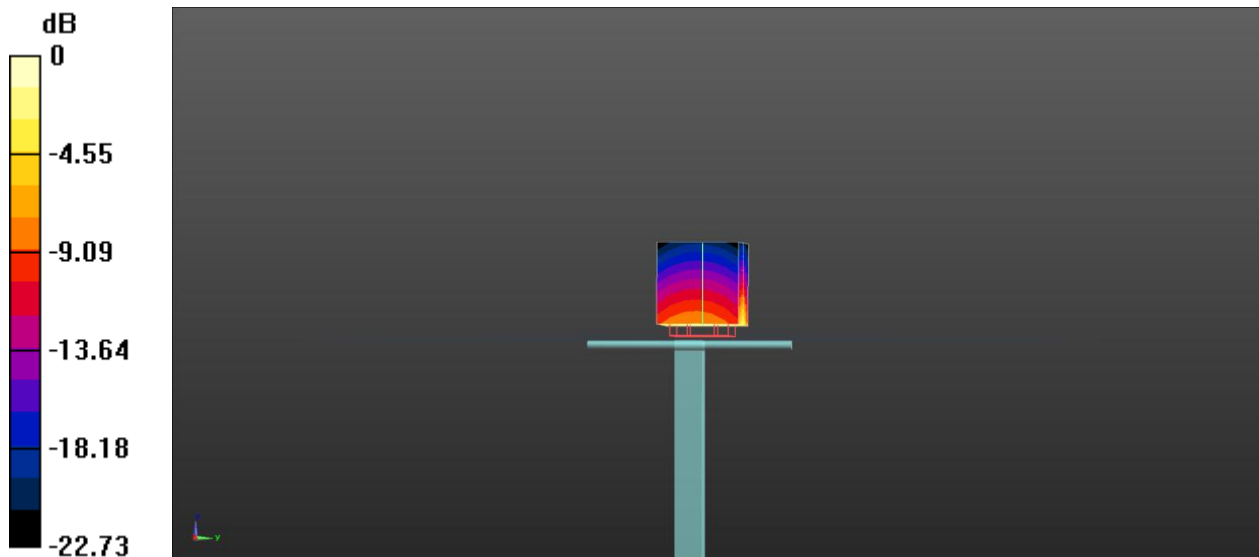
Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 49.37 V/m; Power Drift = -0.10 dB

Peak SAR (extrapolated) = 11.2 W/kg

SAR(1 g) = 5.38 W/kg; SAR(10 g) = 2.41 W/kg

Maximum value of SAR (measured) = 5.99 W/kg



0 dB = 5.99 W/kg = 7.77 dBW/kg

4.6 D2600V2

4.6.1 Dipole 2600 MHz Validation Measurement for Head Tissue

Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2-SN: 1095

Date/Time: 10/23/2016

Communication System Band: D2600 (2600.0 MHz); Frequency: 2600 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 2600$ MHz; $\sigma = 1.96$ S/m; $\epsilon_r = 38.73$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Ambient Temperature: 22.3 Liquid Temperature: 21.0

DASY5 Configuration:

- Probe: EX3DV4 - SN7340; ConvF(7.42, 7.42, 7.42);
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1454;
- Phantom: SAM (30deg probe tilt) with CRP v5.0 Right 1857; Type: QD000P40CD; Serial: TP1857
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

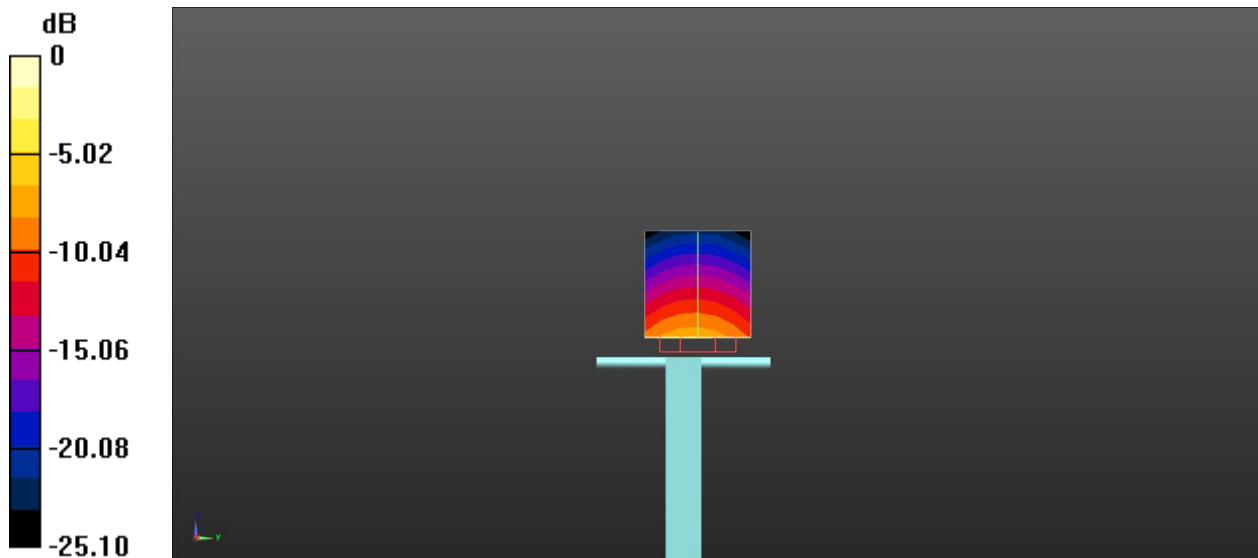
Dipole validation measurement for Head Tissue/Pin= 100mW ,d=10mm /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 53.19 V/m; Power Drift = 0.09 dB

Peak SAR (extrapolated) = 12.4 W/kg

SAR(1 g) = 5.29 W/kg; SAR(10 g) = 2.33 W/kg

Maximum value of SAR (measured) = 6.08 W/kg



0 dB = 6.08 W/kg = 7.84 dBW/kg

4.6.2 Dipole 2600 MHz Validation Measurement for Body Tissue

Dipole 2600 MHz; Type: D2600V2; Serial: D835V2-SN: 1095

Date/Time: 10/23/2016

Communication System Band: D2600 (2600.0 MHz); Frequency: 2600 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 2600$ MHz; $\sigma = 2.18$ S/m; $\epsilon_r = 50.49$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Ambient Temperature: 22.3 Liquid Temperature: 21.0

DASY5 Configuration:

- Probe: EX3DV4 - SN7340; ConvF(6.99,6.99,6.99)
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1454;
- Phantom: SAM (30deg probe tilt) with CRP v5.0 Right 1857; Type: QD000P40CD; Serial: TP1857
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Dipole validation measurement for Body Tissue/Pin= 100mW ,d=10mm /Zoom

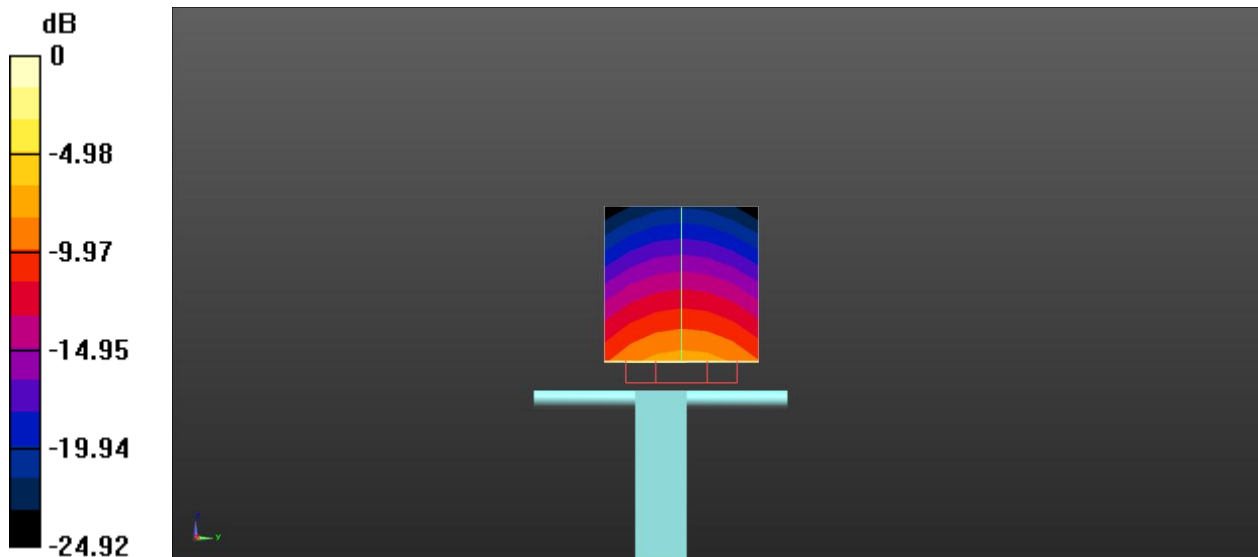
Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 51.67 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 11.9 W/kg

SAR(1 g) = 5.27 W/kg; SAR(10 g) = 2.38 W/kg

Maximum value of SAR (measured) = 6.28 W/kg



0 dB = 6.28 W/kg = 7.98 dBW/kg

4.7 D5GHzV2

4.7.1 Dipole 5 GHz Validation Measurement for Head Tissue

Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2-SN: 1200

Date/Time: 10/26/2016

Communication System Band: D5GHz (5000.0 - 6000.0 MHz);

Frequency: 5200 MHz,

Frequency: 5600 MHz,

Frequency: 5800 MHz;

Duty Cycle: 1:1

Medium parameters used: $f = 5200$ MHz; $\sigma = 4.73$ S/m; $\epsilon_r = 36.21$; $\rho = 1000$ kg/m³ , Medium

parameters used: $f = 5600$ MHz; $\sigma = 4.97$ S/m; $\epsilon_r = 34.83$; $\rho = 1000$ kg/m³ , Medium parameters

used: $f = 5800$ MHz; $\sigma = 5.39$ S/m; $\epsilon_r = 34.37$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Ambient Temperature:22.7 Liquid Temperature:21.5

DASY5 Configuration:

- Probe: EX3DV4 - SN7340; ConvF(5.33, 5.33, 5.33); ConvF(4.70, 4.70, 4.70); ConvF(4.68, 4.68, 4.68);
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1454;
- Phantom: SAM (30deg probe tilt) with CRP v5.0 on left 1859; Type: QD000P40CD; Serial: TP:1859
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

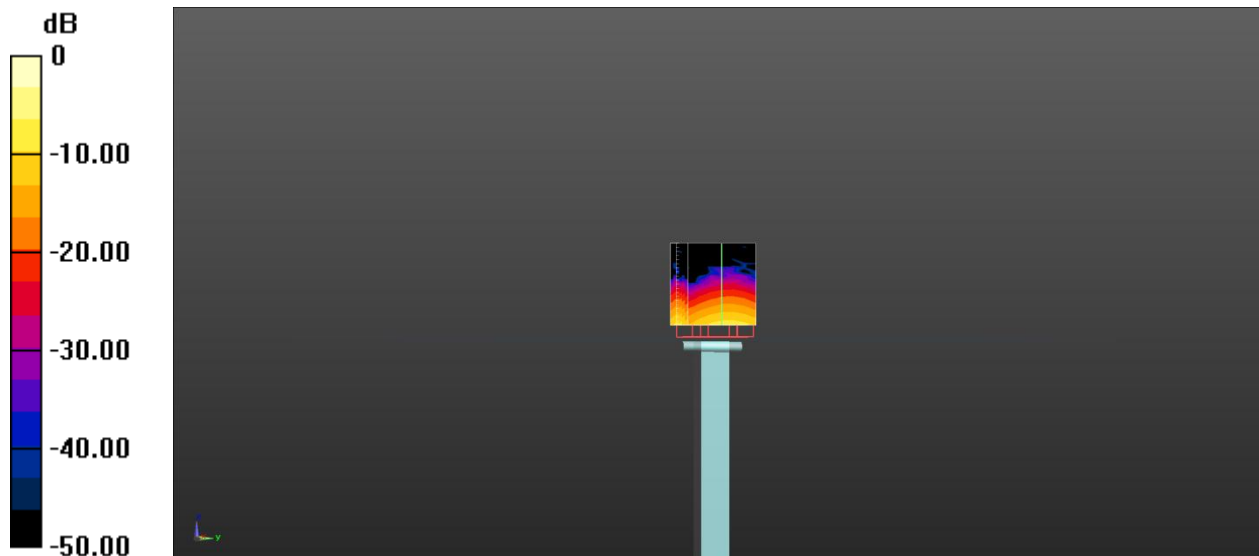
Dipole validation measurement for Head Tissue/Pin= 100mW ,dist=10mm,f=5200 MHz /Zoom Scan (7x7x21)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 44.34 V/m; Power Drift = 0.11 dB

Peak SAR (extrapolated) = 23.6 W/kg

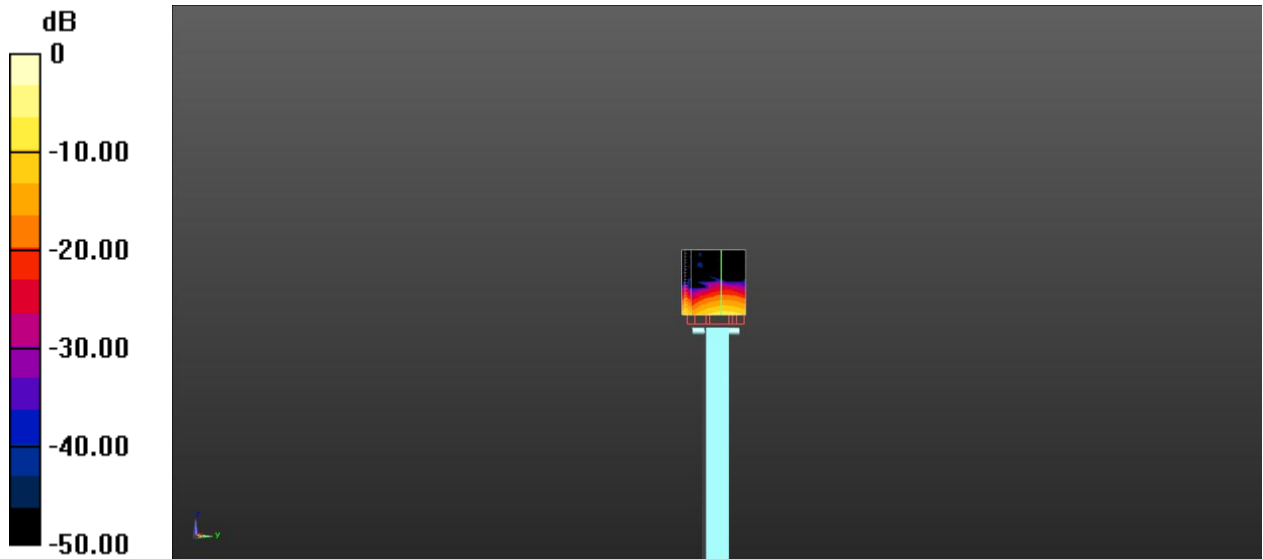
SAR(1 g) = 8.03 W/kg; SAR(10 g) = 2.11 W/kg

Maximum value of SAR (measured) = 9.48 W/kg



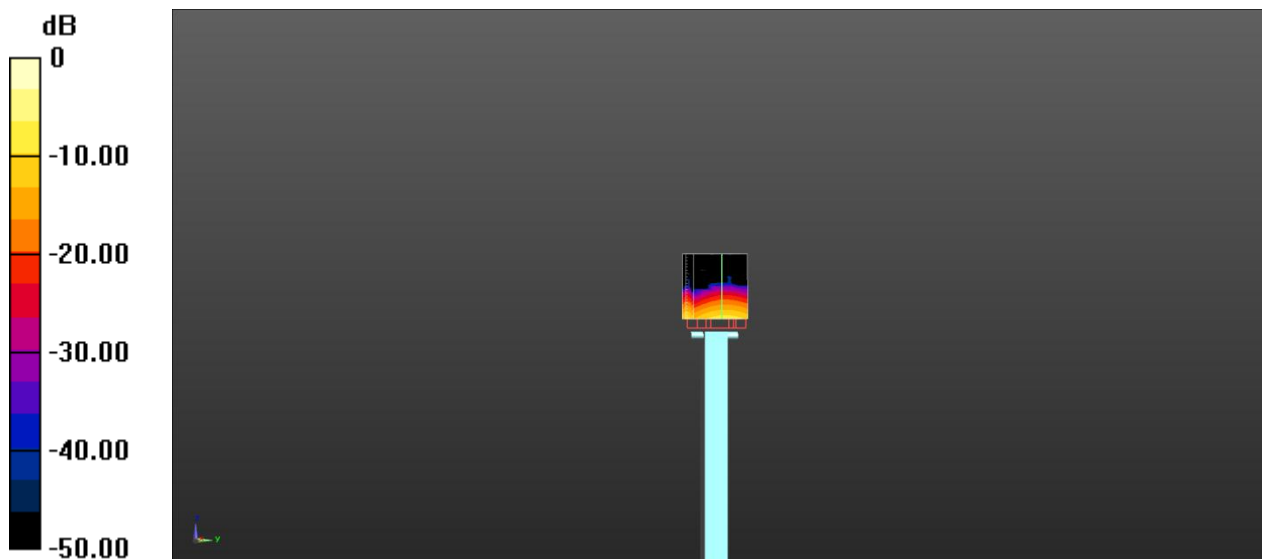
0 dB = 9.48 W/kg = 9.77 dBW/kg

Dipole validation measurement for Head Tissue/Pin= 100mW ,dist=10mm,f=5600 MHz /Zoom Scan (7x7x21)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
 Reference Value = 43.71 V/m; Power Drift = 0.10 dB
 Peak SAR (extrapolated) = 27.8 W/kg
SAR(1 g) = 8.17 W/kg; SAR(10 g) = 2.23 W/kg
 Maximum value of SAR (measured) = 9.36 W/kg



0 dB = 9.36 W/kg = 9.71 dBW/kg

Dipole Calibration for Head Tissue/Pin= 100mW ,dist=10mm,f=5800 MHz /Zoom Scan (7x7x21)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
 Reference Value = 39.51 V/m; Power Drift = 0.07 dB
 Peak SAR (extrapolated) = 24.5 W/kg
SAR(1 g) = 7.39 W/kg; SAR(10 g) = 2.09 W/kg
 Maximum value of SAR (measured) = 8.19 W/kg



0 dB = 8.19 W/kg = 9.13 dBW/kg

4.7.2 Dipole 5 GHz Validation Measurement for Body Tissue

Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2-SN: 1200

Date/Time: 10/26/2016

Communication System Band: D5GHz (5000.0 - 6000.0 MHz); Frequency: 5200 MHz; Frequency: 5600 MHz; Frequency: 5800 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 5200$ MHz; $\sigma = 5.41$ S/m; $\epsilon_r = 48.93$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5600$ MHz; $\sigma = 5.74$ S/m; $\epsilon_r = 47.08$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5800$ MHz; $\sigma = 5.91$ S/m; $\epsilon_r = 46.83$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Ambient Temperature:22.7 Liquid Temperature:21.5

DASY5 Configuration:

- Probe: EX3DV4 - SN7340; ConvF(4.56, 4.56, 4.56);ConvF(3.98, 3.98, 3.98); ConvF(4.15, 4.15, 4.15);
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1454;
- Phantom: SAM (30deg probe tilt) with CRP v5.0 on left 1859; Type: QD000P40CD; Serial: TP:1859
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

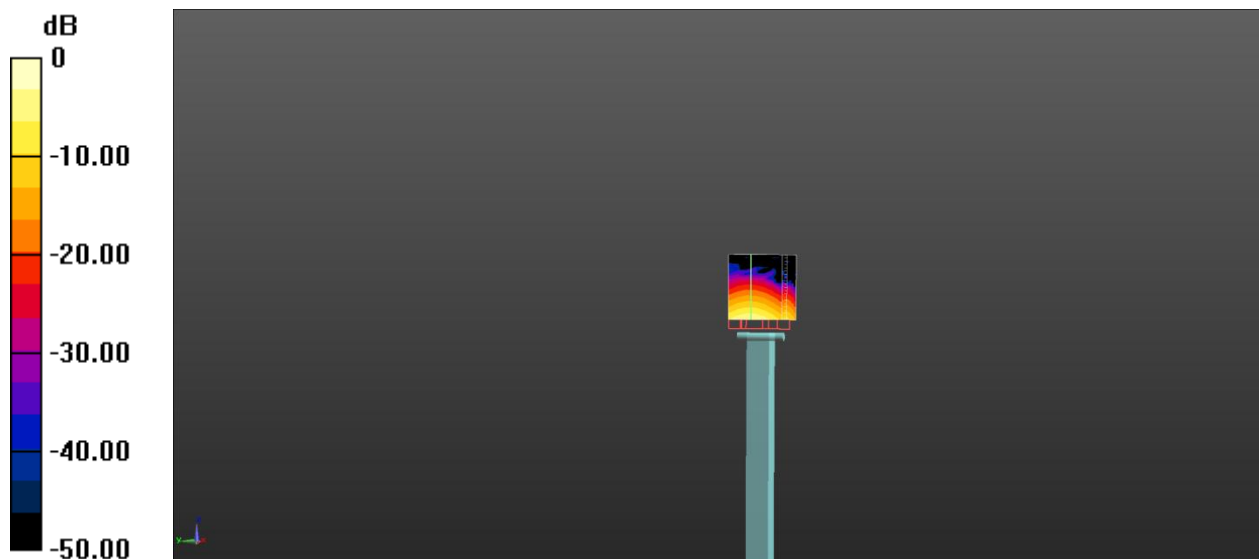
Dipole validation measurement for Body Tissue/Pin= 100mW ,dist=10mm,f=5200 MHz /Zoom Scan (7x7x21)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 45.81 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 27.5 W/kg

SAR(1 g) = 8.14 W/kg; SAR(10 g) = 2.30 W/kg

Maximum value of SAR (measured) = 9.92 W/kg



0 dB = 9.92 W/kg = 9.97 dBW/kg



Dipole validation measurement for Body Tissue/Pin= 100mW , dist=10mm,f=5600 MHz /Zoom Scan (7x7x21)/Cube 0:

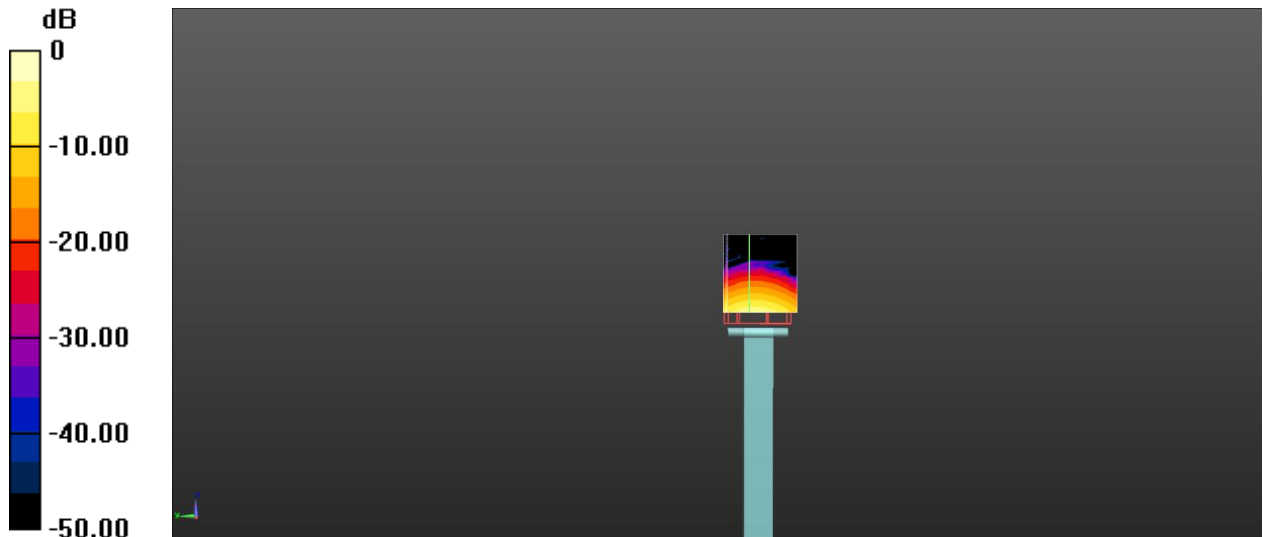
Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 47.08 V/m; Power Drift = 0.13 dB

Peak SAR (extrapolated) = 34.7 W/kg

SAR(1 g) = 8.36 W/kg; SAR(10 g) = 2.24 W/kg

Maximum value of SAR (measured) = 10.1 W/kg



0 dB = 10.1 W/kg = 10.04 dBW/kg

Dipole validation measurement for Body Tissue/Pin= 100mW ,dist=10mm,f=5800 MHz /Zoom Scan (7x7x21)/Cube 0:

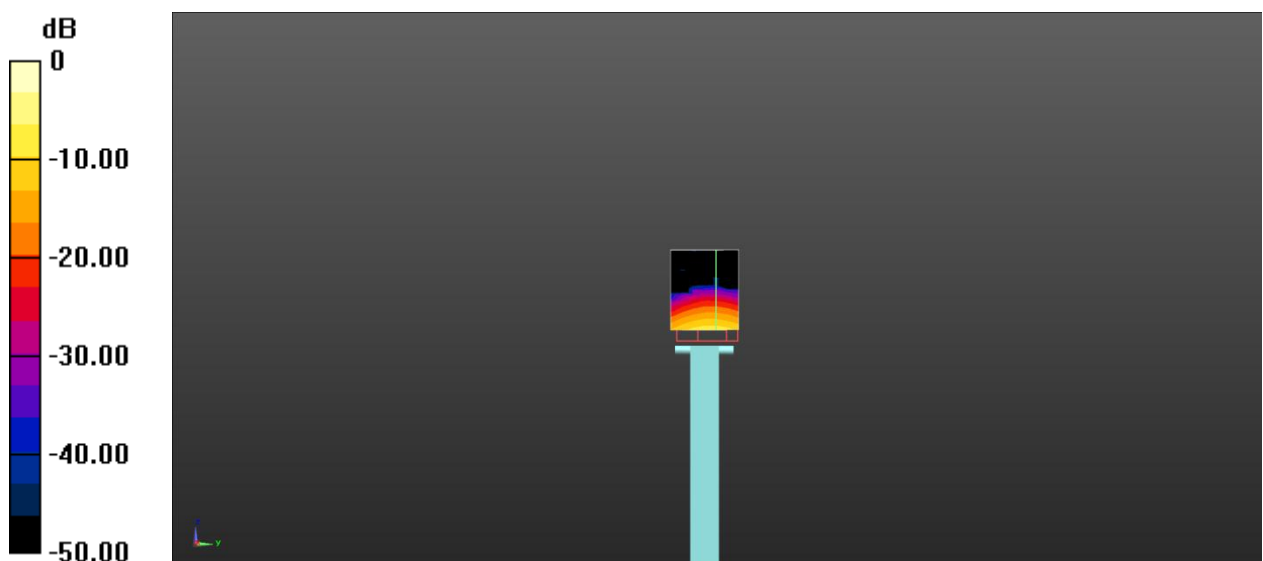
Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 41.93 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 29.5 W/kg

SAR(1 g) = 8.08 W/kg; SAR(10 g) = 2.21 W/kg

Maximum value of SAR (measured) = 9.39 W/kg



0 dB = 9.39 W/kg = 9.73 dBW/kg

--END OF REPORT--