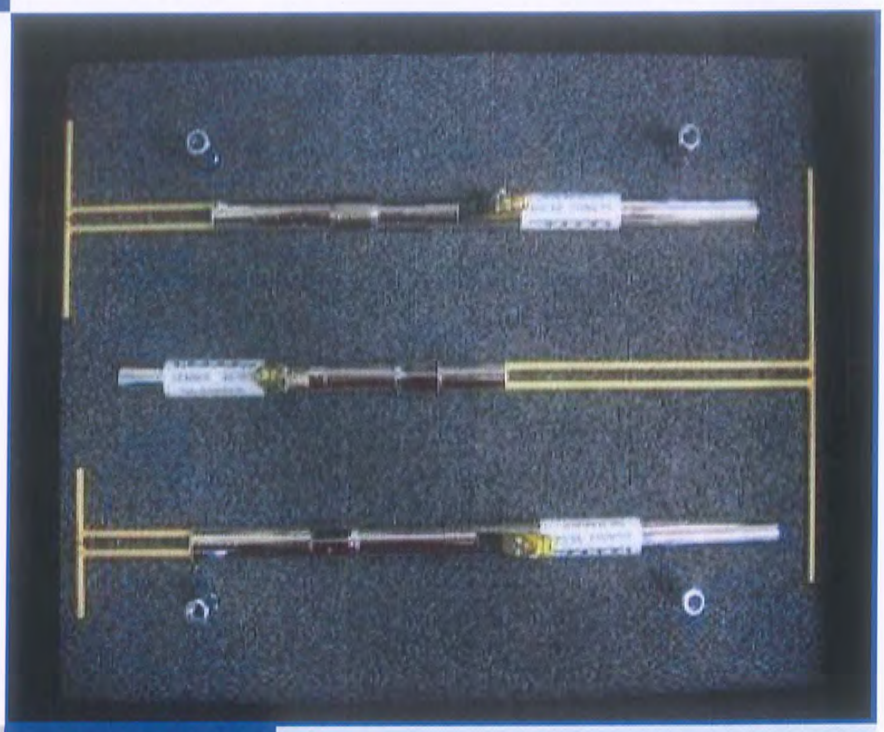
SAR Dipole

Performance Measurement Report

ISSUED BY
Shenzhen BALUN Technology Co., Ltd.

FOR
Validation Dipoles



Tested by: Tu Lang
(Engineer)

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:	Nov. 23, 2016 ~ Nov. 26, 2016
Date of Issue:	Nov. 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 5 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	2015/11/25	2015/11/27	2015/11/25	2015/11/24	2015/11/24	2015/11/26
Current meas. Date	2016/11/24	2016/11/26	2016/11/24	2016/11/23	2016/11/23	2016/11/25

1.3 Test Equipment List

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
PC	Dell	N/A	N/A	N/A	N/A
E-Field Probe	Speag	EX3DV4	SN: 7340	2015/12/10	2016/12/09
Data Acquisition Electronics	Speag	DAE4	SN: 1454	2015/12/08	2016/12/07
Signal Generator	R&S	SMBV100A	260592	2016/07/13	2017/07/12
Power Meter	Agilent	E4419B	GB40201833	2016/07/13	2017/07/12
Power Sensor	Agilent	E9300A	MY41498012	2016/07/13	2017/07/12
Power Sensor	Agilent	E9300A	MY41499891	2016/07/13	2017/07/12
Power Amplifier	SATIMO	6552B	22374	N/A	N/A
Network Analyzer	R&S	ZVL-6	101380	2016/07/13	2017/07/12
Thermometer	Elitech	RC-4HC	N/A	2016/02/13	2017/02/12
Dielectric Probe Kit	SATIMO	SCLMP	SN 25/13 OCPG56	N/A	N/A
Phantom1	Speag	SAM	SN: 1859	N/A	N/A
Phantom2	Speag	SAM	SN: 1857	N/A	N/A
Attenuator	COM-MW	ZA-S1-31	1305003187	N/A	N/A
Directional coupler	AA-MCS	AAMCS-UDC	000272	N/A	N/A

1.4 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.

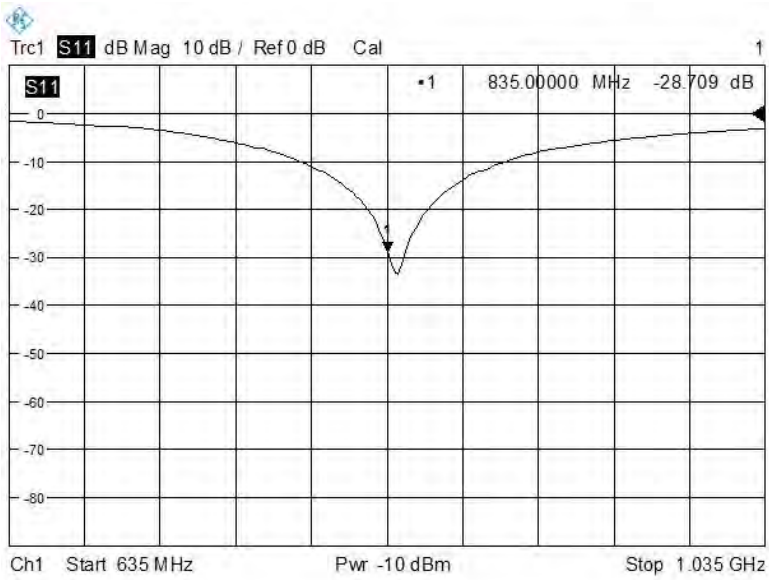
Note:
The “Previous Meas.” in the following table refer to dipoles or other equivalent RF sources calibration reports.

3.1 D835V2

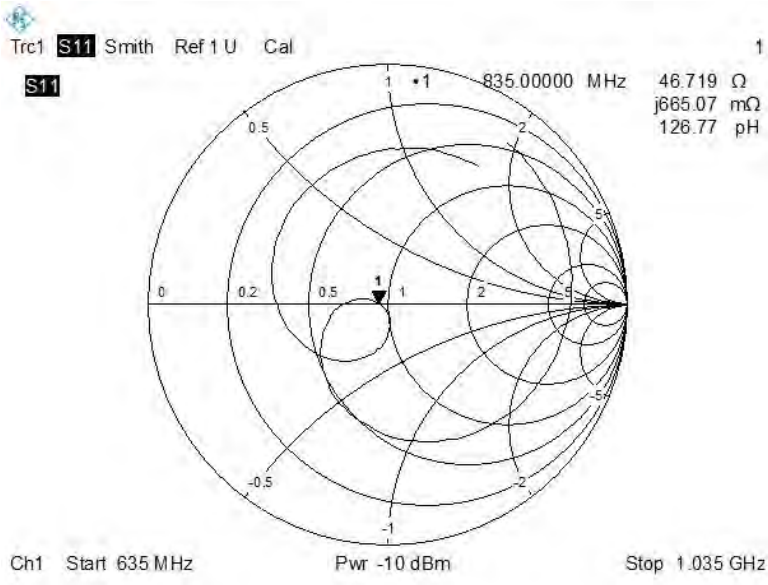
RETURN LOSS AND IMPEDANCE IN HEAD LIQUID

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

Return Loss



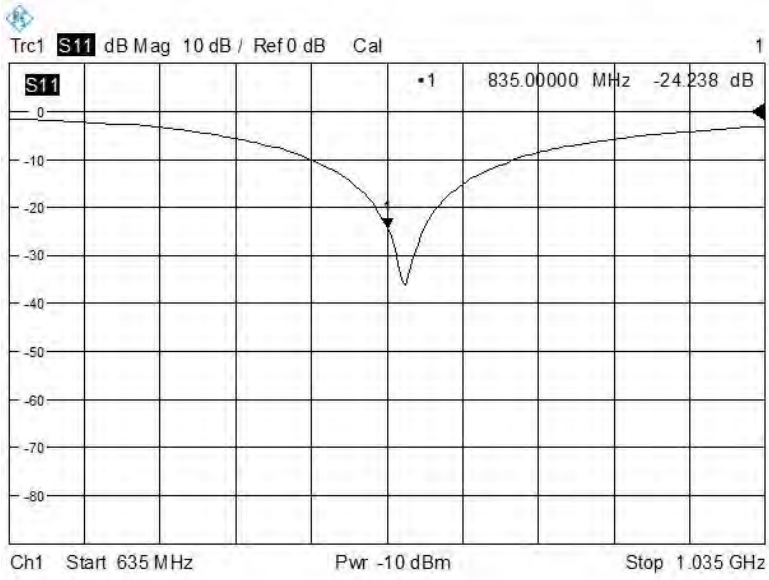
Impedance



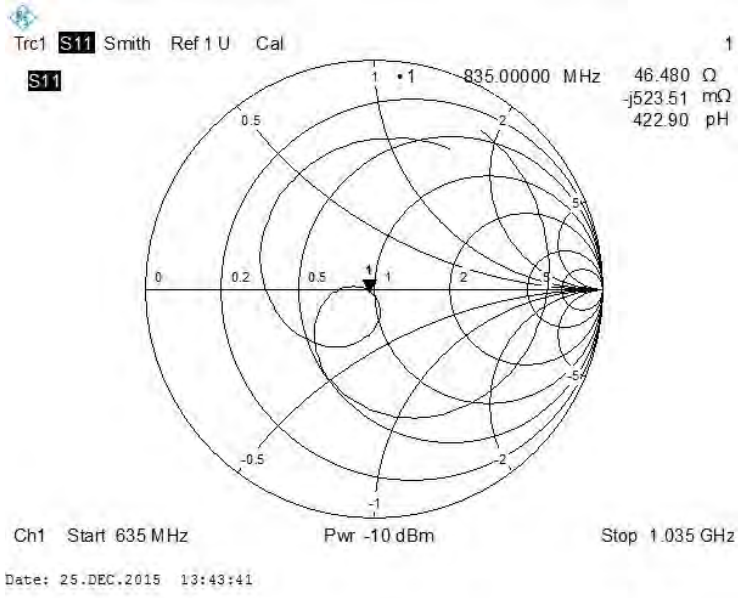
RETURN LOSS AND IMPEDANCE IN BODY LIQUID

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

Return Loss



Impedance

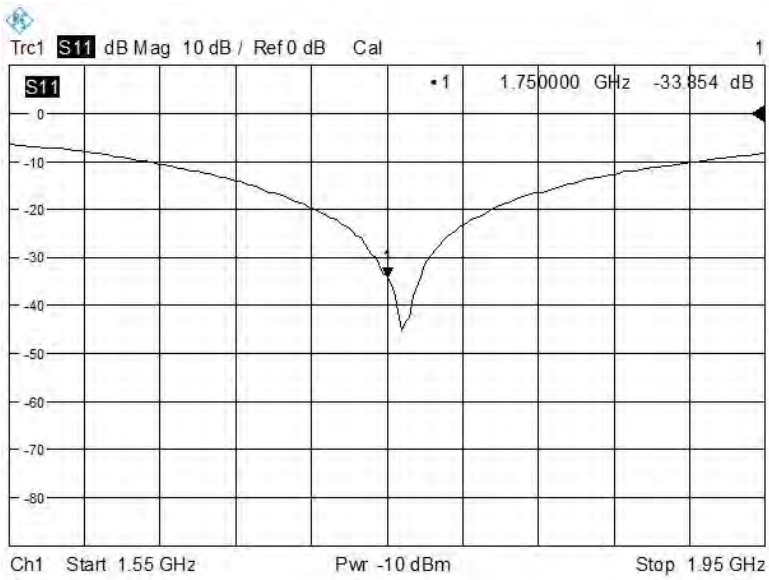


3.2 D1750V2

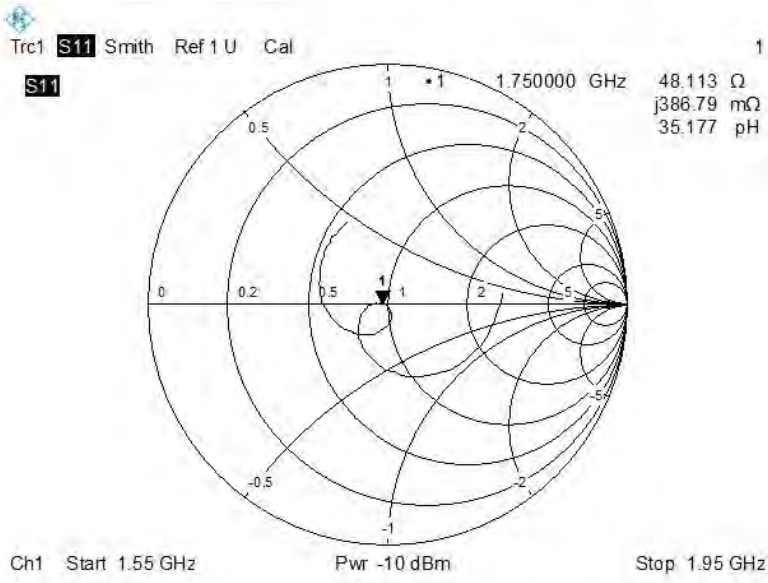
RETURN LOSS AND IMPEDANCE IN HEAD LIQUID

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

Return Loss



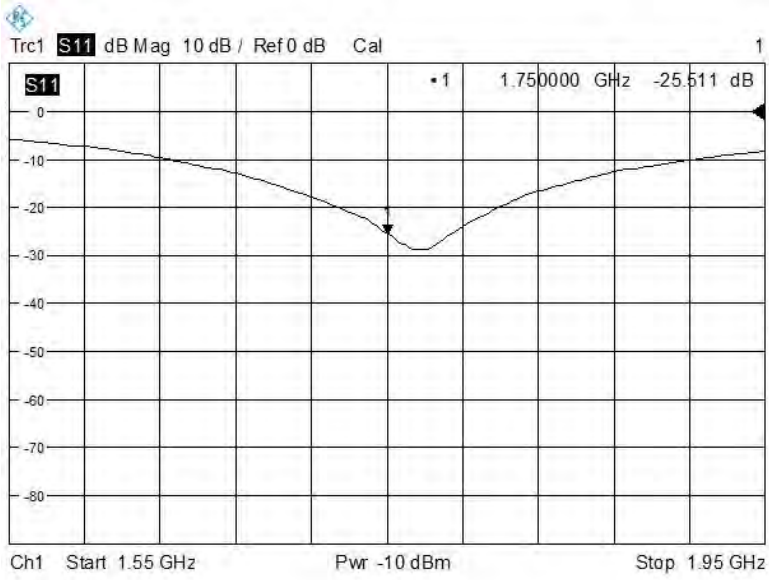
Impedance



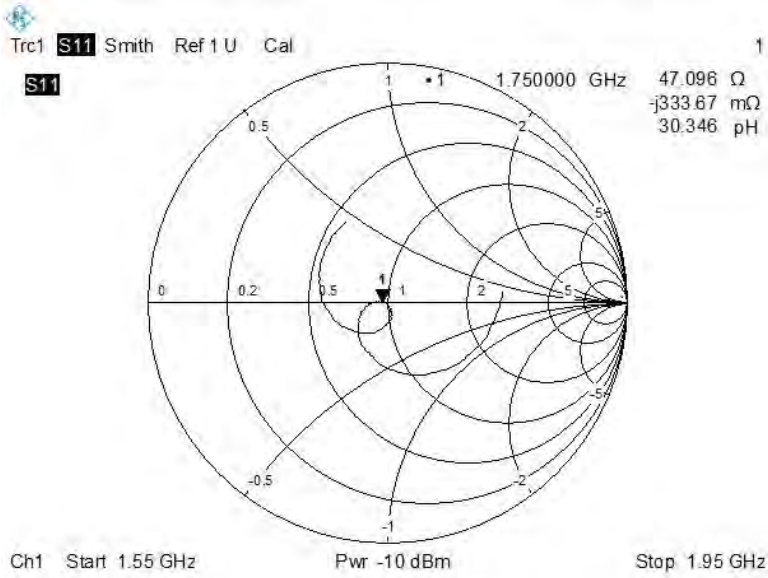
RETURN LOSS AND IMPEDANCE IN BODY LIQUID

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

Return Loss



Impedance

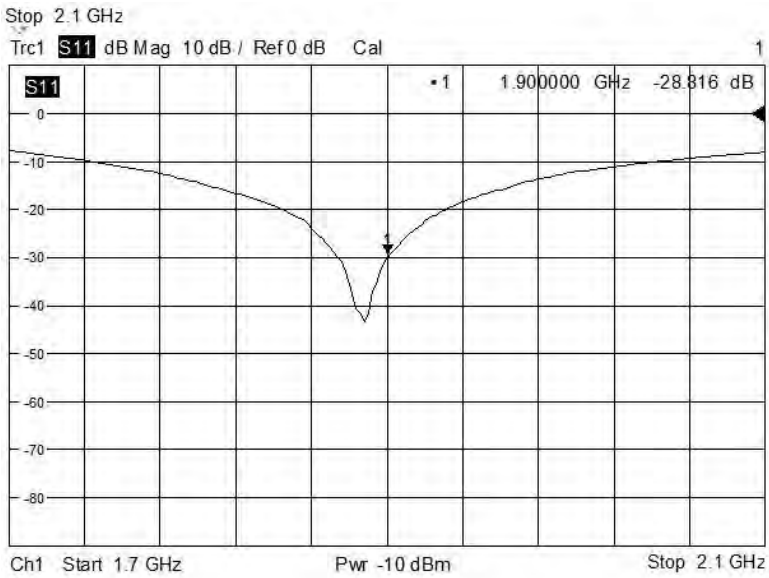


3.3 D1900V2

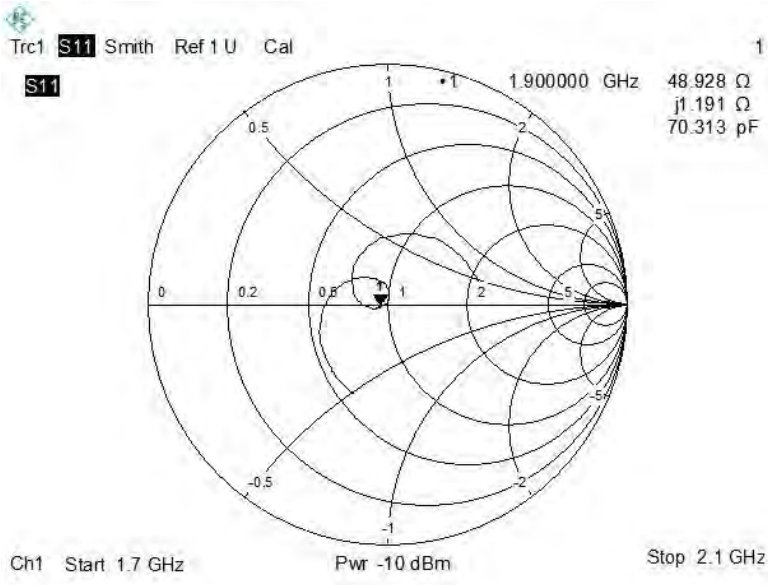
RETURN LOSS AND IMPEDANCE IN HEAD LIQUID

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

Return Loss



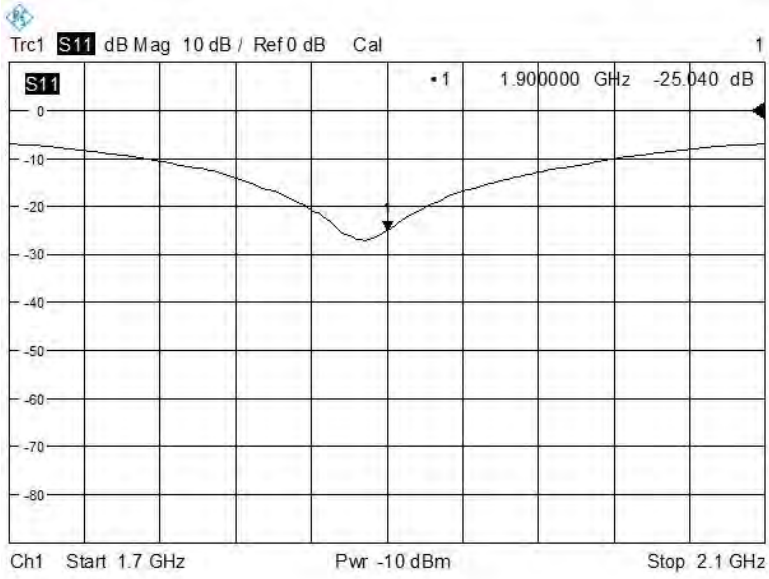
Impedance



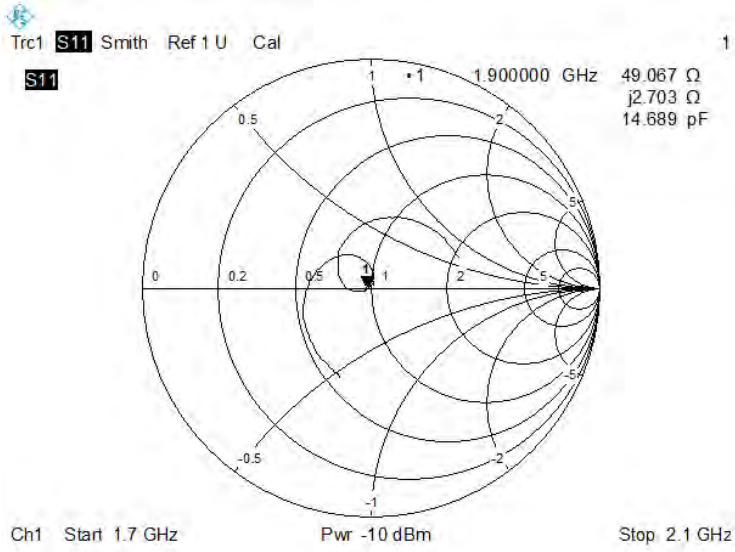
RETURN LOSS AND IMPEDANCE IN BODY LIQUID

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

Return Loss



Impedance

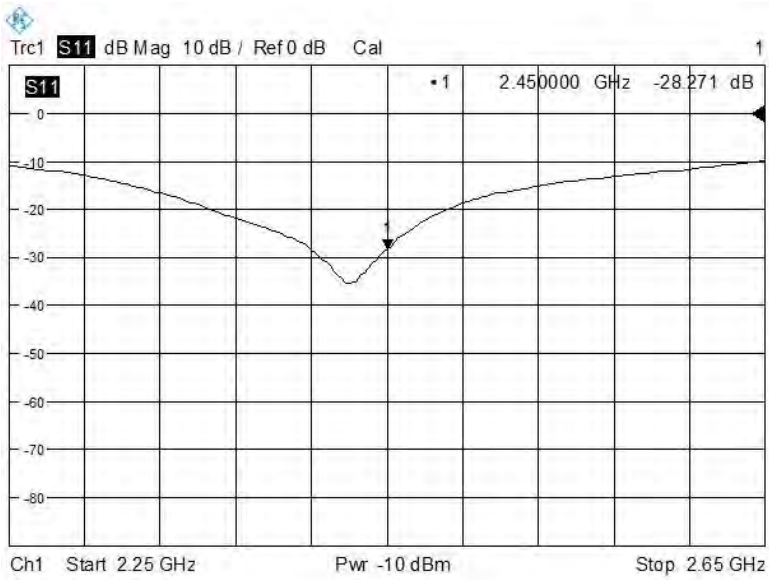


3.4 D2450V2

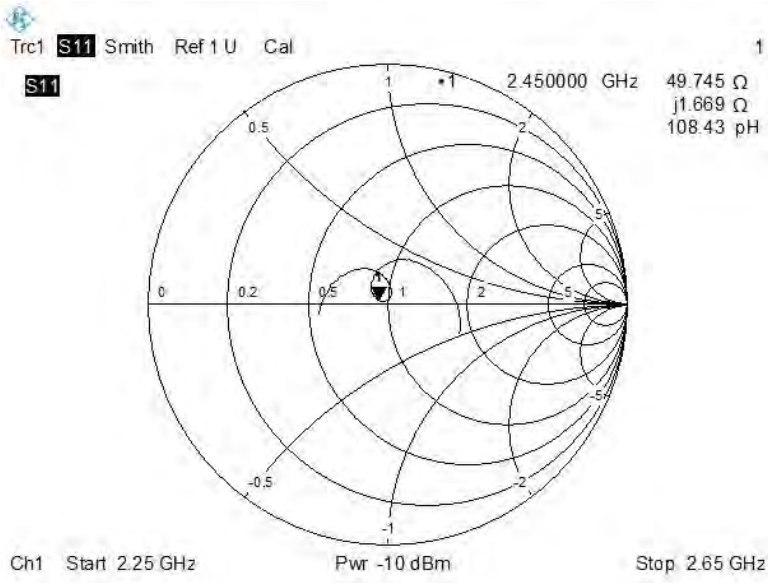
RETURN LOSS AND IMPEDANCE IN HEAD LIQUID

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

Return Loss



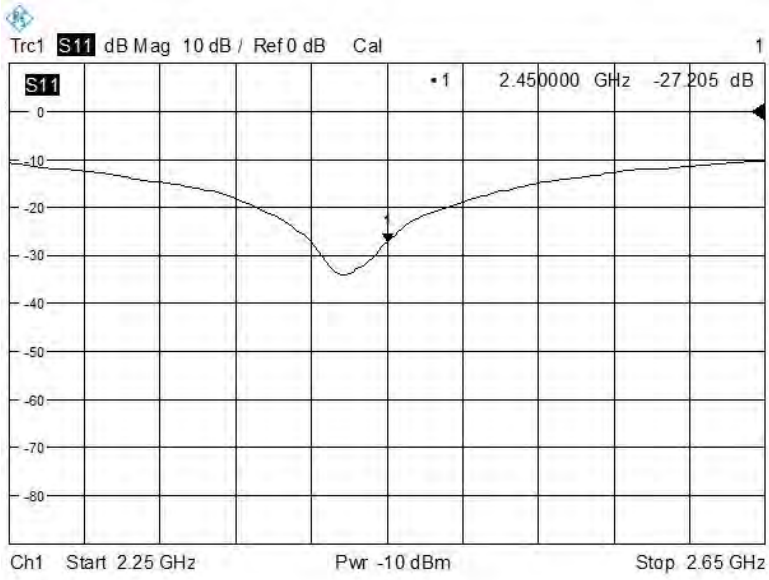
Impedance



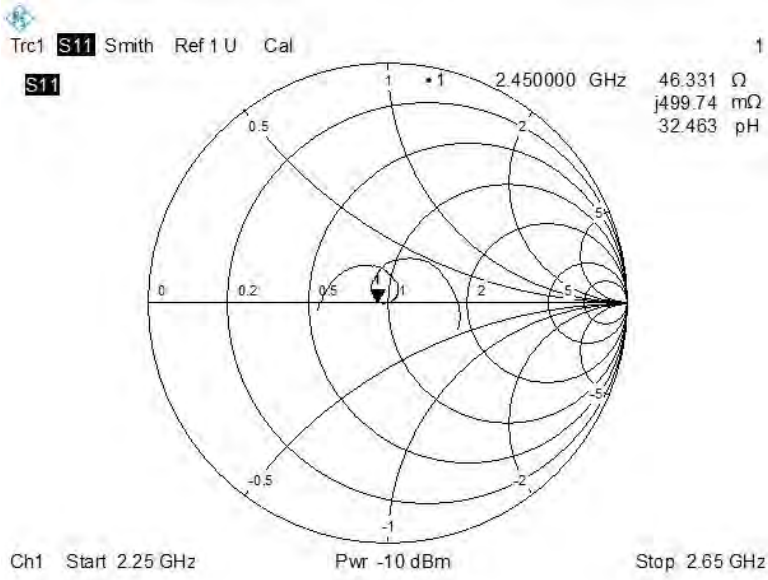
RETURN LOSS AND IMPEDANCE IN BODY LIQUID

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

Return Loss



+Impedance

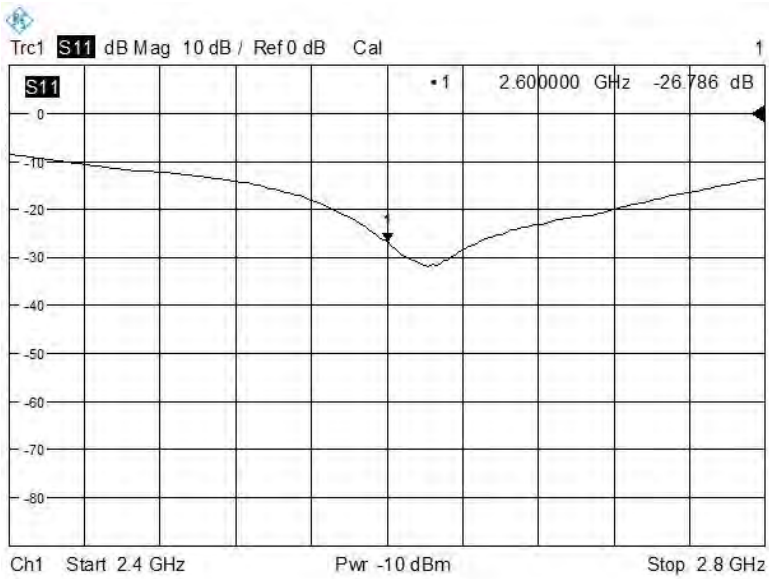


3.5 D2600V2

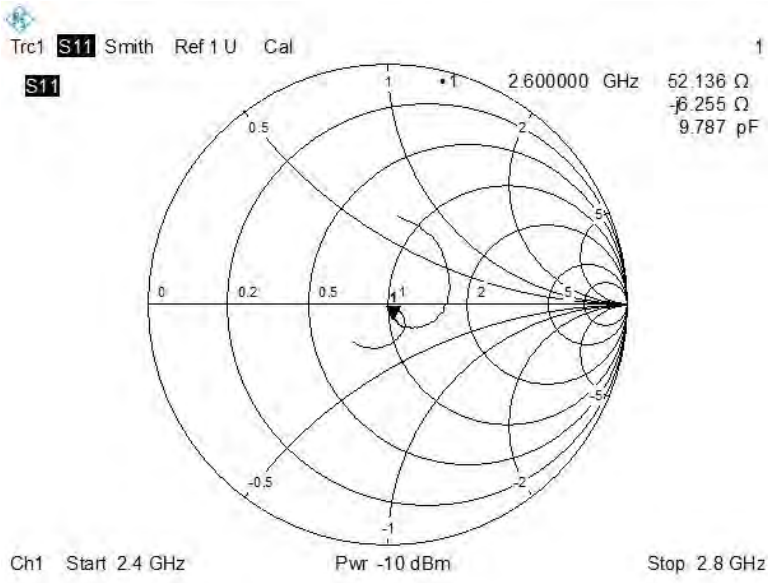
RETURN LOSS AND IMPEDANCE IN HEAD LIQUID

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

Return Loss



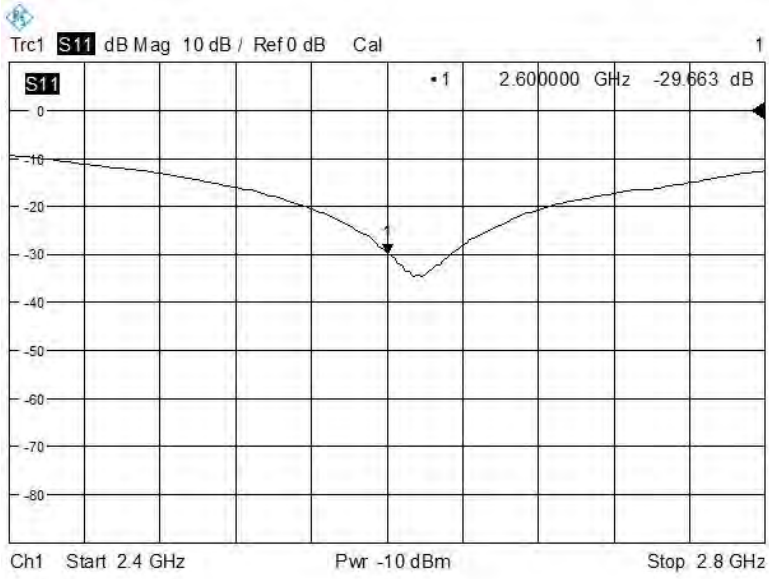
Impedance



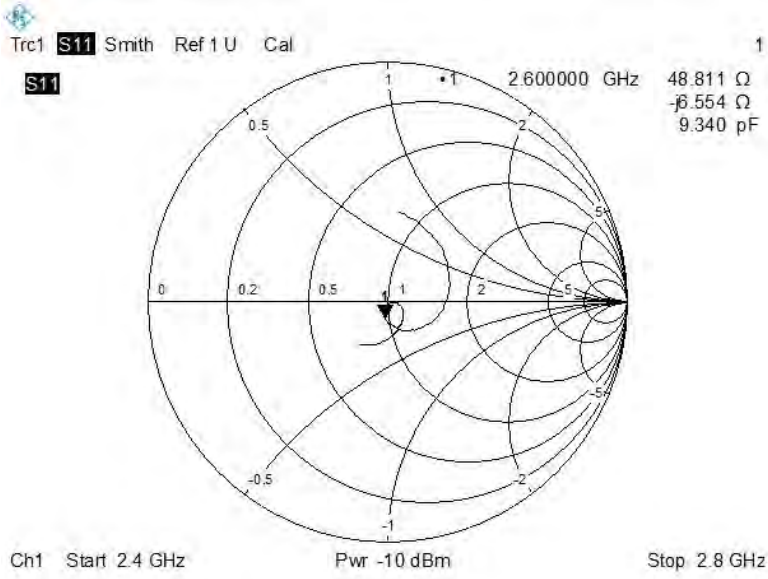
RETURN LOSS AND IMPEDANCE IN BODY LIQUID

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

Return Loss



Impedance

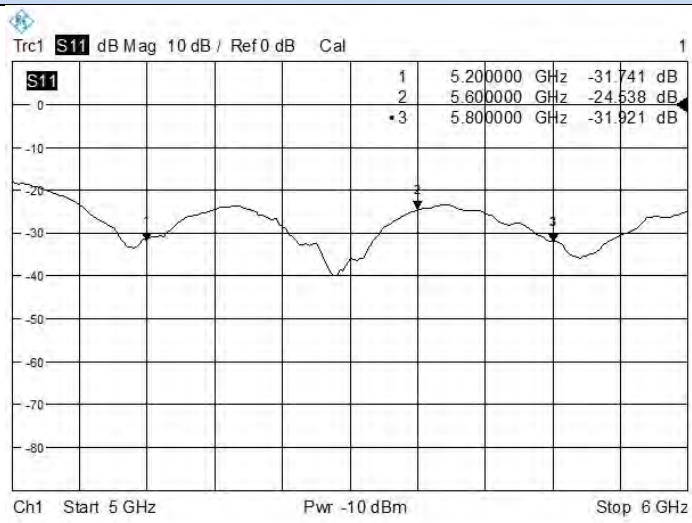


3.6 D5GHzV2

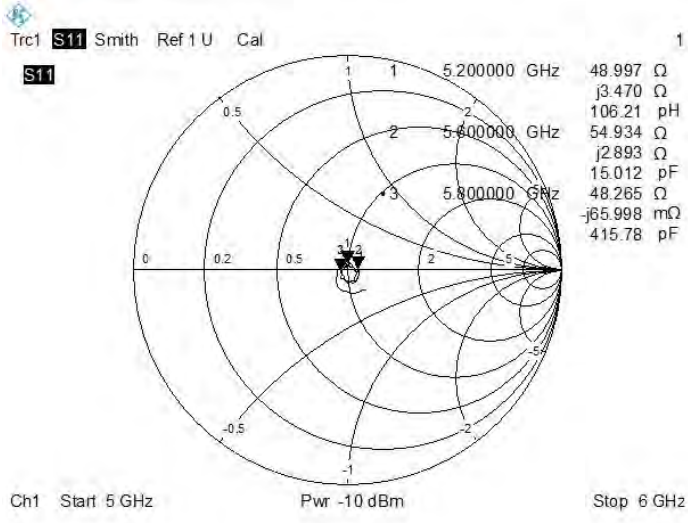
RETURN LOSS AND IMPEDANCE IN HEAD LIQUID

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 jΩ	47.8 Ω + 1.415 jΩ	2.055Ω (Imaginary part)
5600 MHz			
Return Loss (dB)	-24.538	-22.615	8.5%
Impedance	54.9 Ω+2.893 jΩ	53.4 Ω +2.757 jΩ	1.500Ω (Real part)
5800 MHz			
Return Loss (dB)	-31.921	-29.503	8.2%
Impedance	48.3 Ω - 0.066 jΩ	51.1 Ω + 3.189 jΩ	-3.255Ω (Imaginary part)

Return Loss



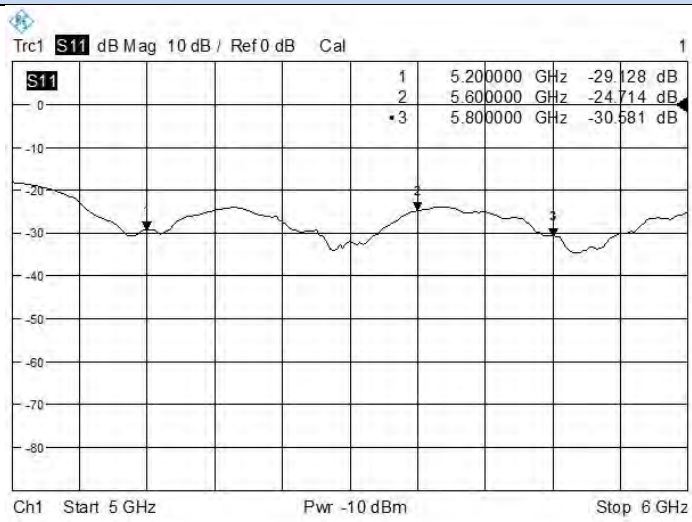
Impedance



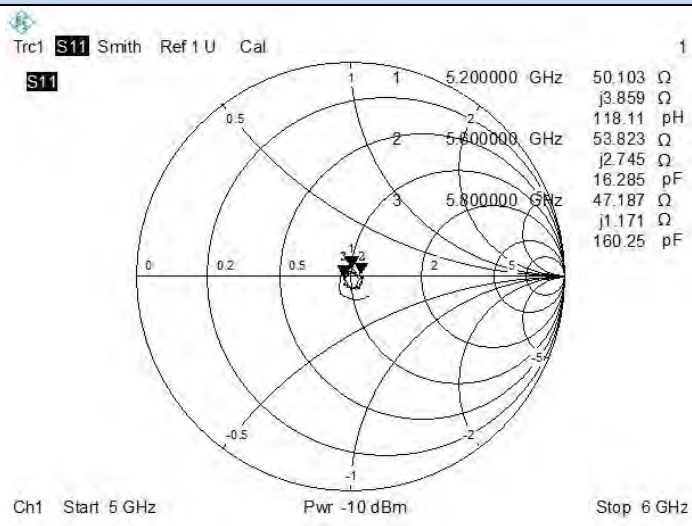
RETURN LOSS AND IMPEDANCE IN BODY LIQUID

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 jΩ	47.2 Ω + 1.088 jΩ	2.9Ω (Real part)
5600 MHz			
Return Loss (dB)	-24.714	-21.932	12.7%
Impedance	53.8 Ω +2.745 jΩ	52.0 Ω +2.425 jΩ	1.8Ω (Real part)
5800 MHz			
Return Loss (dB)	-30.581	-28.420	7.6%
Impedance	47.2 Ω + 1.171 jΩ	51.6 Ω + 3.436 jΩ	-4.4Ω (Real part)

Return Loss

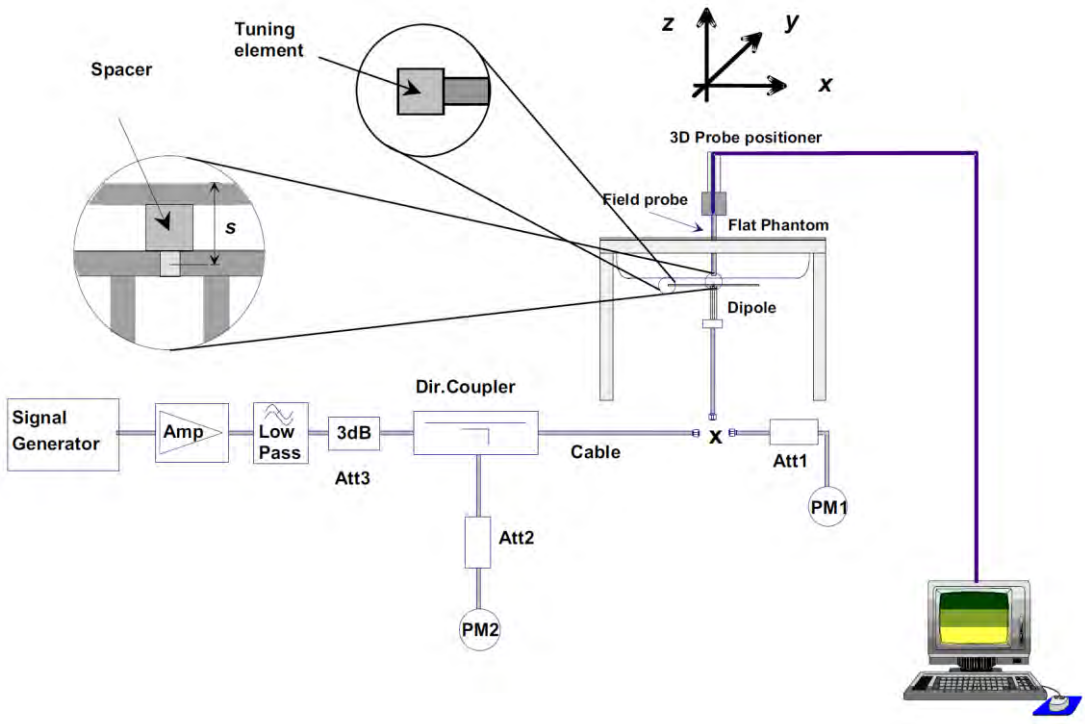


Impedance



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)	Normalized SAR (W/kg)	10 g Measured SAR (W/kg)	Normalized 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

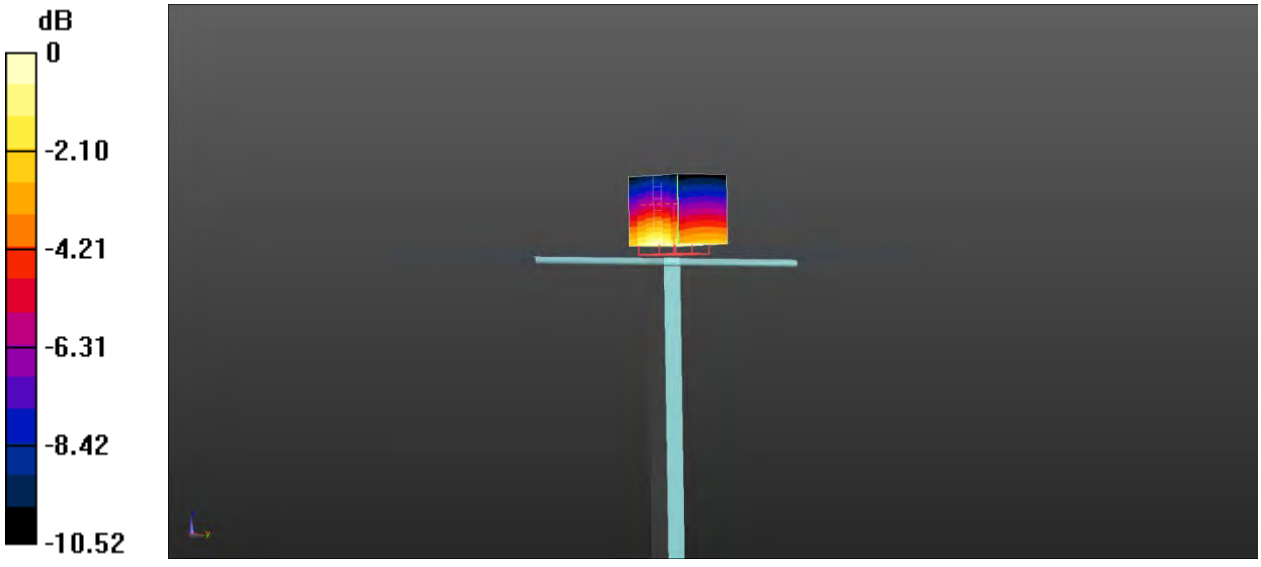
4.2 D835V2

4.2.1 Dipole 835 MHz Validation Measurement for Head Tissue

Dipole 835 MHz; Type: D835V2; Serial: D835V2-SN: 4d187
Date/Time: 11/24/2016
Communication System Band: D835 (835.0 MHz); Frequency: 835 MHz; Duty Cycle: 1:1
Medium parameters used: f = 835 MHz; σ = 0.89 S/m; ε_r = 41.31 ρ = 1000 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=5mm, dy=5mm, dz=5mm
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



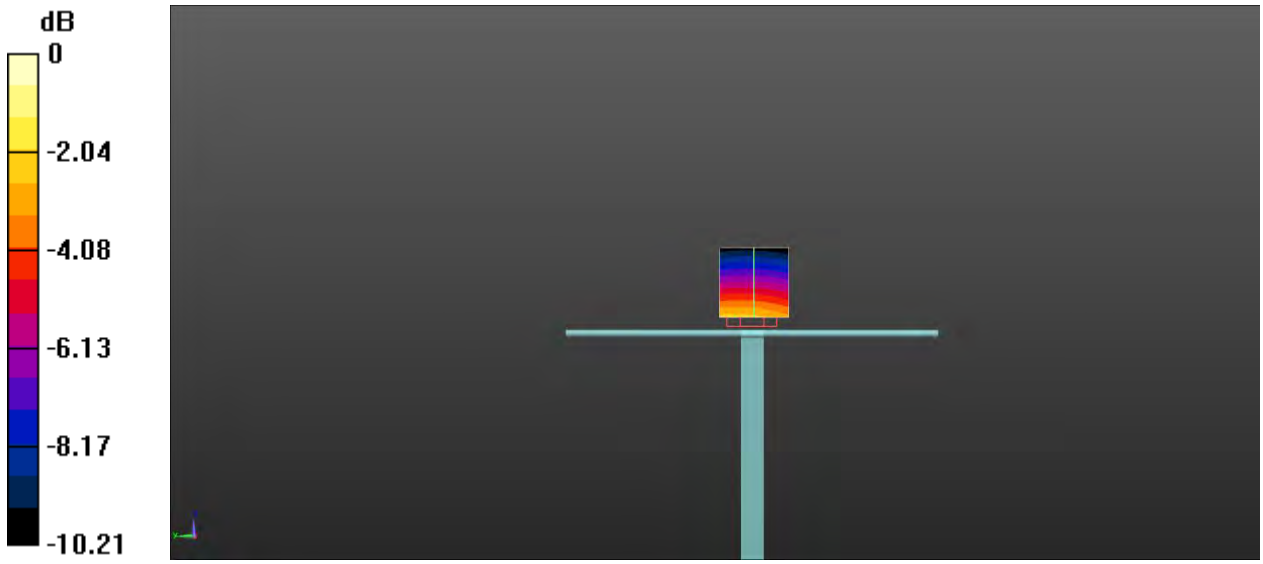
0 dB = 1.04 W/kg = 0.17 dBW/kg

4.2.2 Dipole 835 MHz Validation Measurement for Body Tissue

Dipole 835 MHz; Type: D835V2; Serial: D835V2-SN: 4d187
Date/Time: 11/24/2016
Communication System Band: D835 (835.0 MHz); Frequency: 835 MHz;Duty Cycle: 1:1
Medium parameters used: f = 835 MHz; σ = 0.96 S/m; ε_r = 55.83; ρ = 1000 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=5mm, dy=5mm, dz=5mm
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

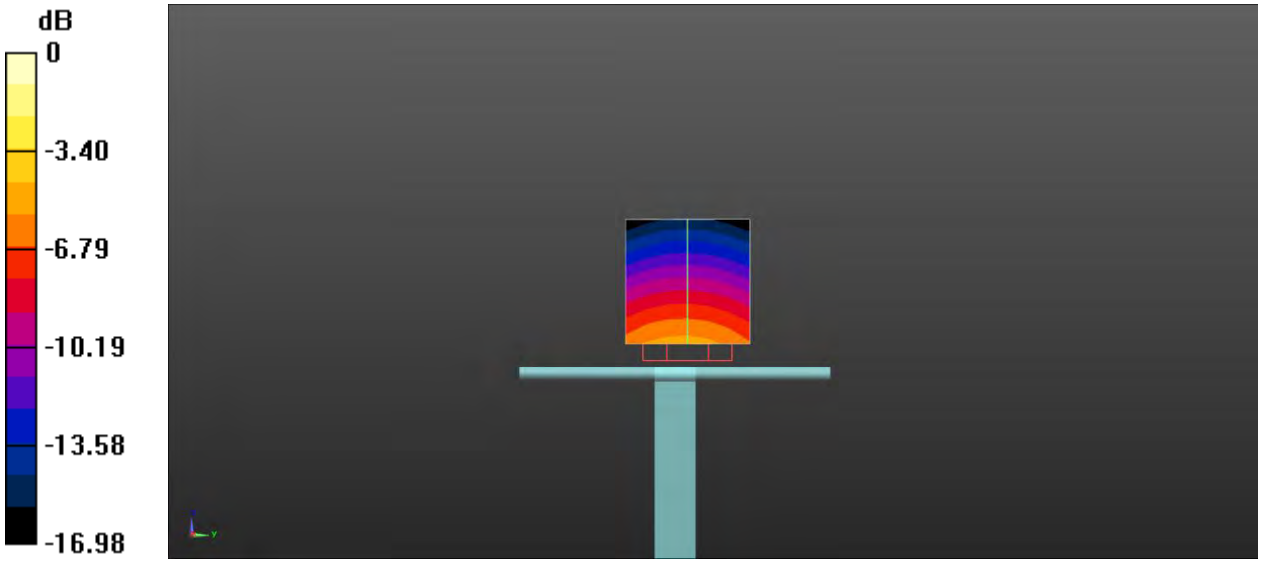
4.3 D1750V2

4.3.1 Dipole 1750 MHz Validation Measurement for Head Tissue

Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2-SN: 1130
Date/Time: 11/26/2016
Communication System Band: D1750 (1750.0 MHz); Frequency: 1750 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1750 MHz; σ = 1.38 S/m; ε_r = 39.86; ρ = 1000 kg/m^3
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



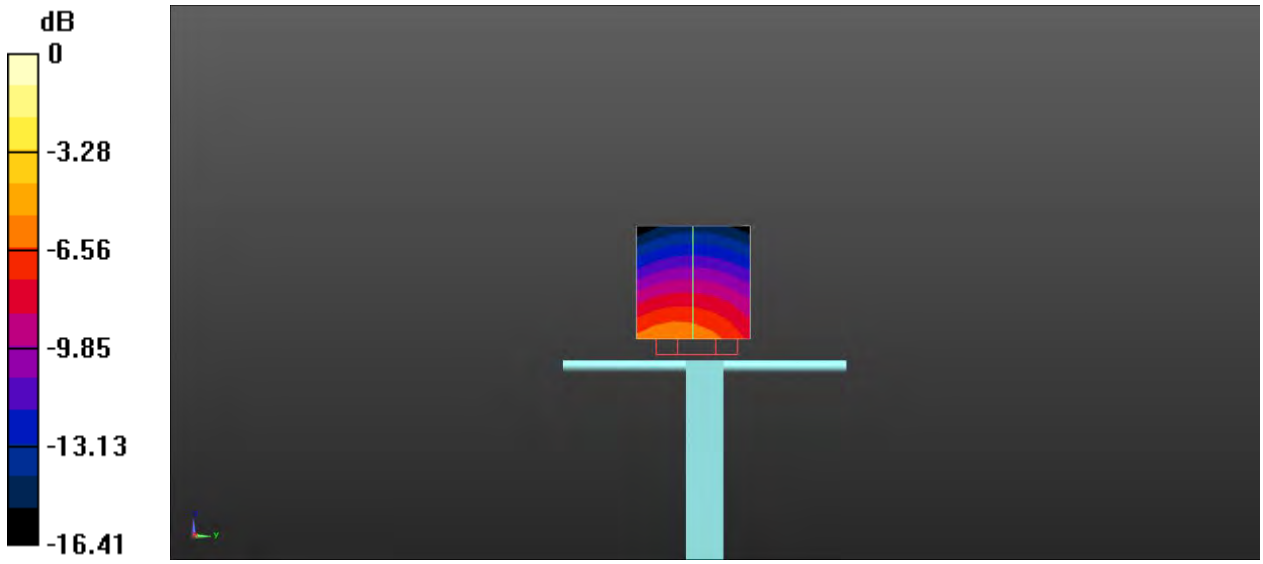
0 dB = 3.79 W/kg = 5.79 dBW/kg

4.3.2 Dipole 1750 MHz Validation Measurement for Body Tissue

Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2-SN: 1130
Date/Time: 11/26/2016
Communication System Band: D1750 (1750.0 MHz); Frequency: 1750 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1750 MHz; σ = 1.47 S/m; ε_r = 52.80; ρ = 1000 kg/m^3
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

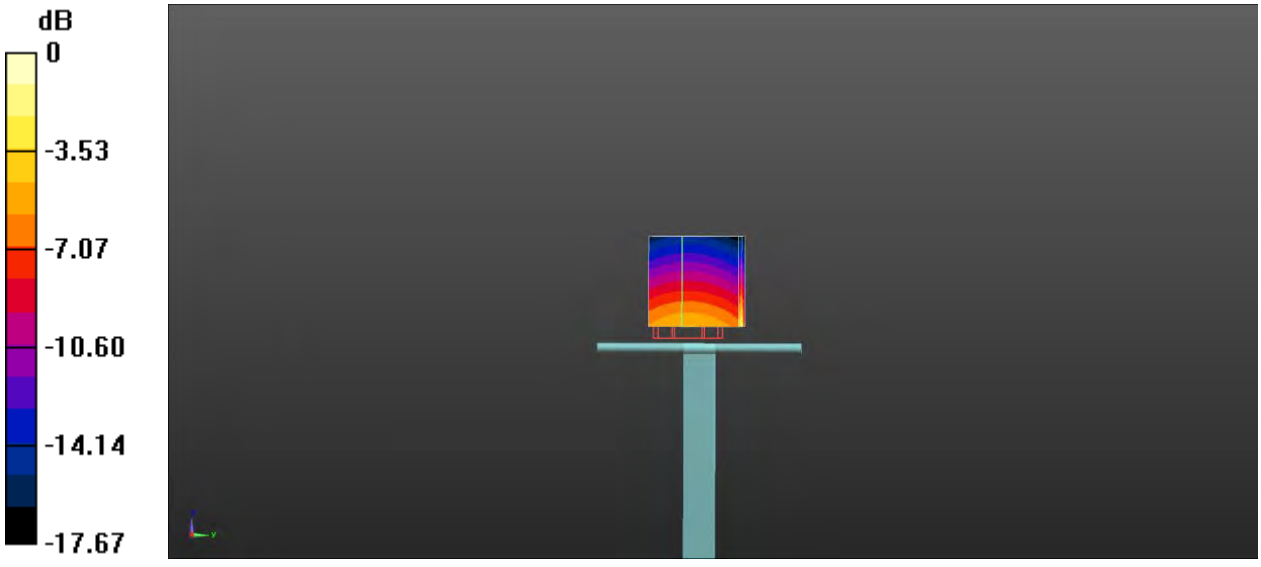
4.4 D1900V2

4.4.1 Dipole 1900 MHz Validation Measurement for Head Tissue

Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2-SN: 5d193
Date/Time: 11/24/2016
Communication System Band: D1900 (1900.0 MHz); Frequency: 1900 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1900 MHz; σ = 1.41 S/m; ε_r = 39.64; ρ = 1000 kg/m^3
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



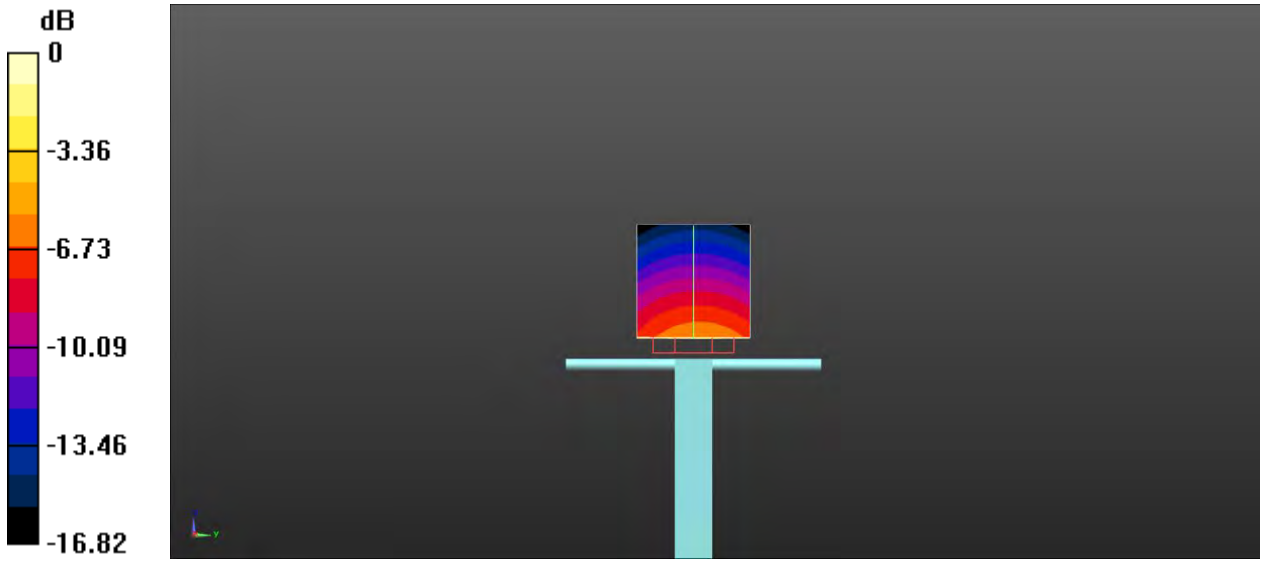
0 dB = 4.25 W/kg = 6.28 dBW/kg

4.4.2 Dipole 1900 MHz Validation Measurement for Body Tissue

Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2-SN: 5d193
Date/Time: 11/24/2016
Communication System Band: D1900 (1900.0 MHz); Frequency: 1900 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1900 MHz; σ = 1.52 S/m; ε_r = 51.41; ρ = 1000 kg/m^3
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

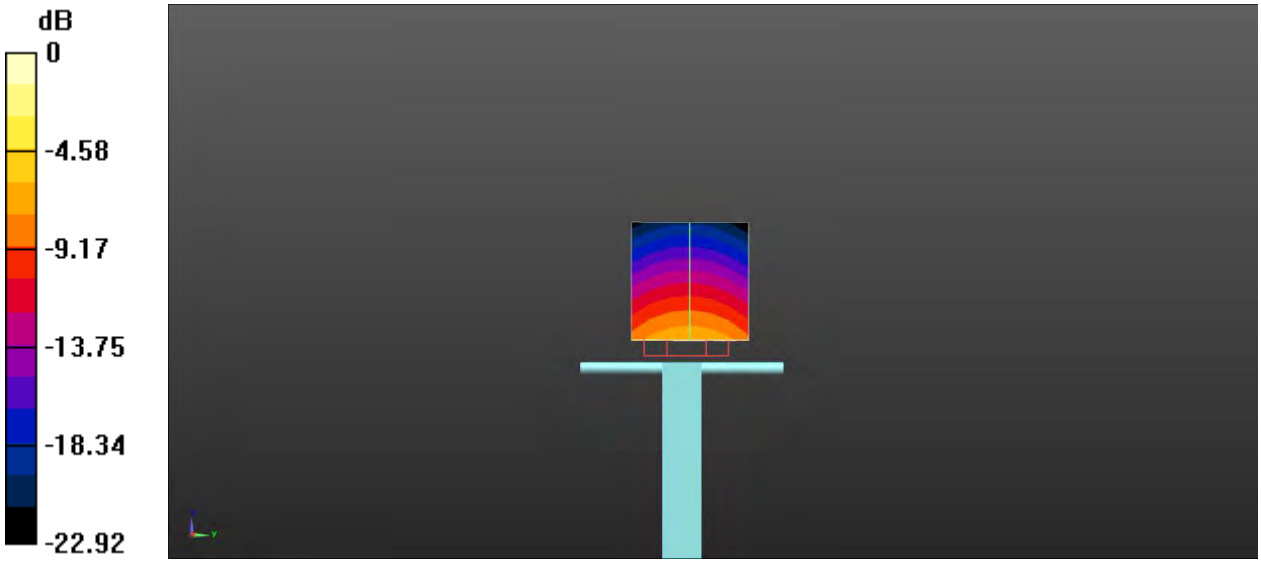
4.5 D2450V2

4.5.1 Dipole 2450 MHz Validation Measurement for Head Tissue

Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2-SN: 952
Date/Time: 11/23/2016
Communication System Band: CD2450 (2450.0 MHz); Frequency: 2450 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2450 MHz; σ = 1.85 S/m; ε_r = 39.11; ρ = 1000 kg/m^3
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



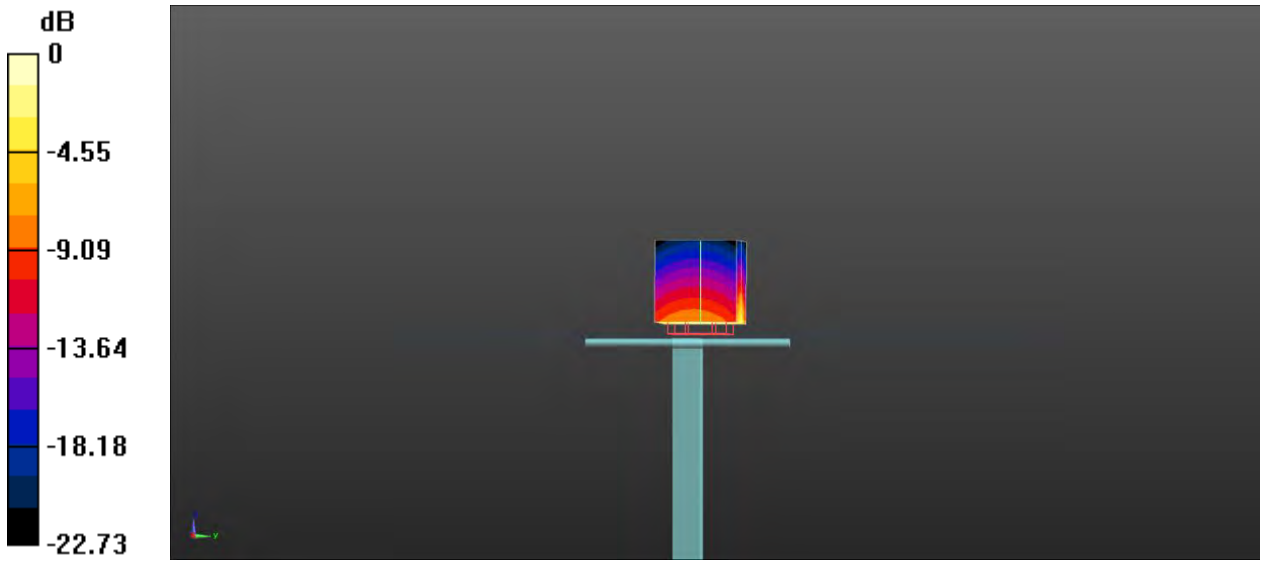
0 dB = 6.26 W/kg = 7.97 dBW/kg

4.5.2 Dipole 2450 MHz Validation Measurement for Body Tissue

Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2-SN: 952
Date/Time: 11/23/2016
Communication System Band: D2450 (2450.0 MHz); Frequency: 2450 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2450 MHz; σ = 1.96 S/m; ε_r = 51.07; ρ = 1000 kg/m^3
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

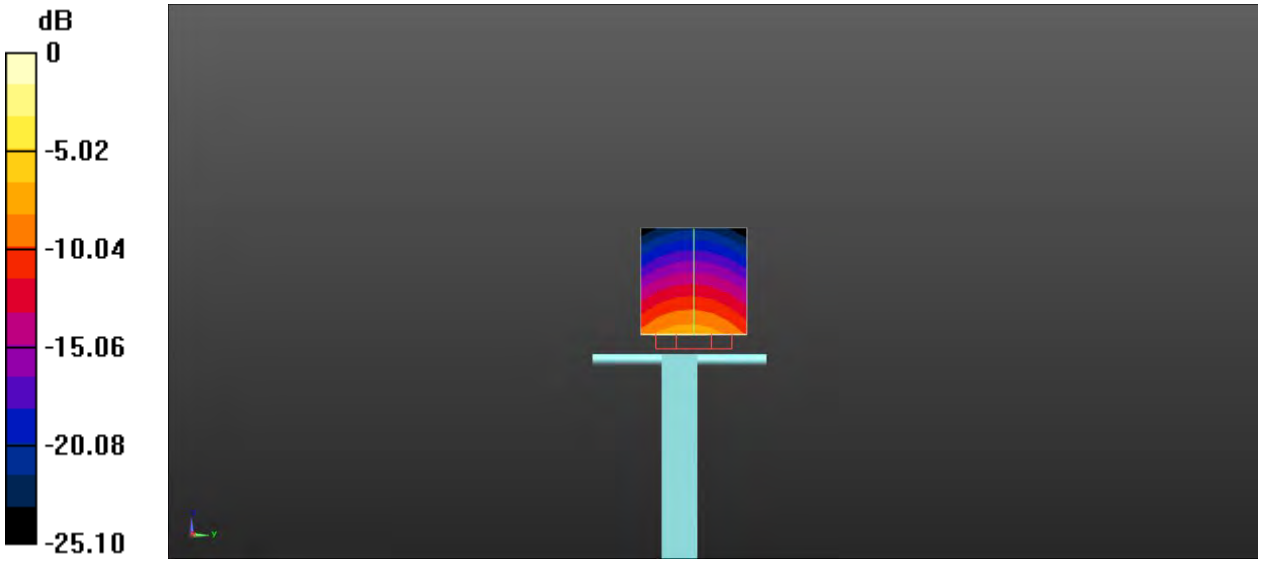
4.6 D2600V2

4.6.1 Dipole 2600 MHz Validation Measurement for Head Tissue

Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2-SN: 1095
Date/Time: 11/23/2016
Communication System Band: D2600 (2600.0 MHz); Frequency: 2600 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2600 MHz; σ = 1.96 S/m; ε_r = 38.73; ρ = 1000 kg/m^3
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



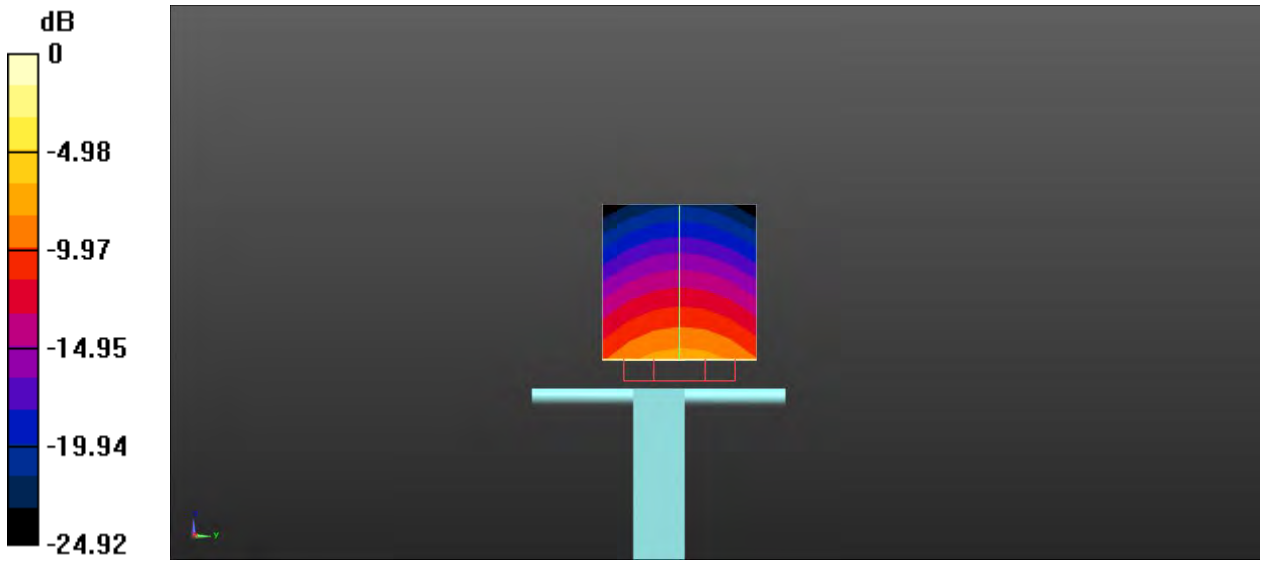
0 dB = 6.08 W/kg = 7.84 dBW/kg

4.6.2 Dipole 2600 MHz Validation Measurement for Body Tissue

Dipole 2600 MHz; Type: D2600V2; Serial: D835V2-SN: 1095
Date/Time: 11/23/2016
Communication System Band: D2600 (2600.0 MHz); Frequency: 2600 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2600 MHz; σ = 2.18 S/m; ε_r = 50.49; ρ = 1000 kg/m^3
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

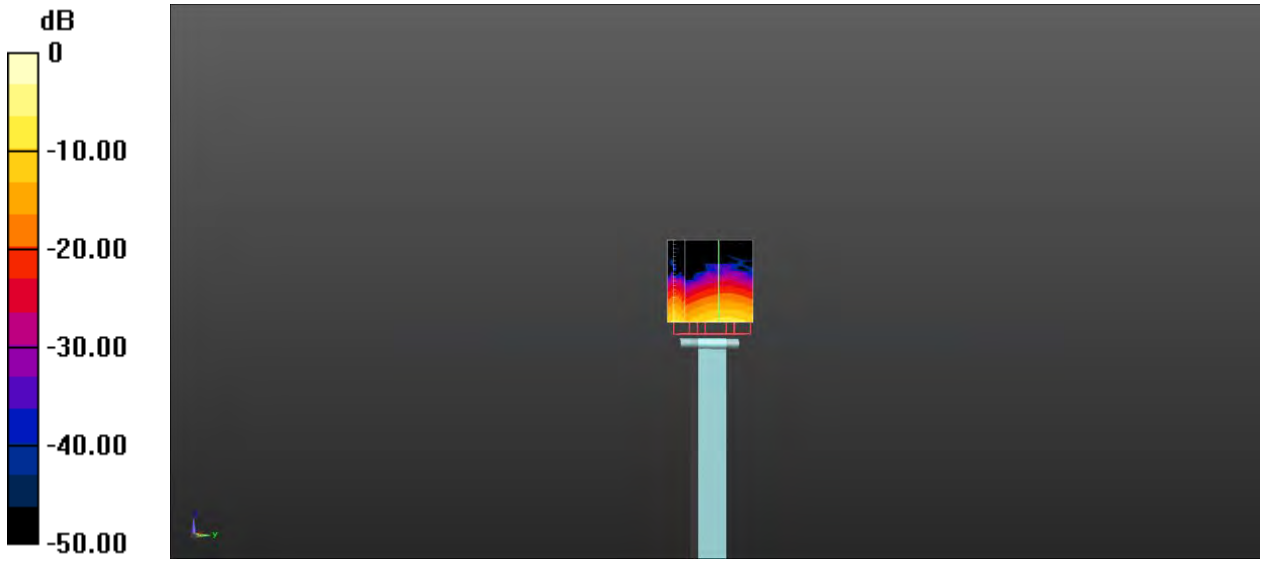
4.7 D5GHzV2

4.7.1 Dipole 5 GHz Validation Measurement for Head Tissue

Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2-SN: 1200
Date/Time: 11/25/2016
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; σ = 4.73 S/m; ε_r = 36.21; ρ = 1000 kg/m^3 , Medium parameters used: f = 5600 MHz; σ = 4.97 S/m; ε_r = 34.83; ρ = 1000 kg/m^3 , Medium parameters used: f = 5800 MHz; σ = 5.39 S/m; ε_r = 34.37; ρ = 1000 kg/m^3
Phantom section: Flat Section
Ambient Temperature:22.7 Liquid Temperature:21.5
DASY5 Configuration:

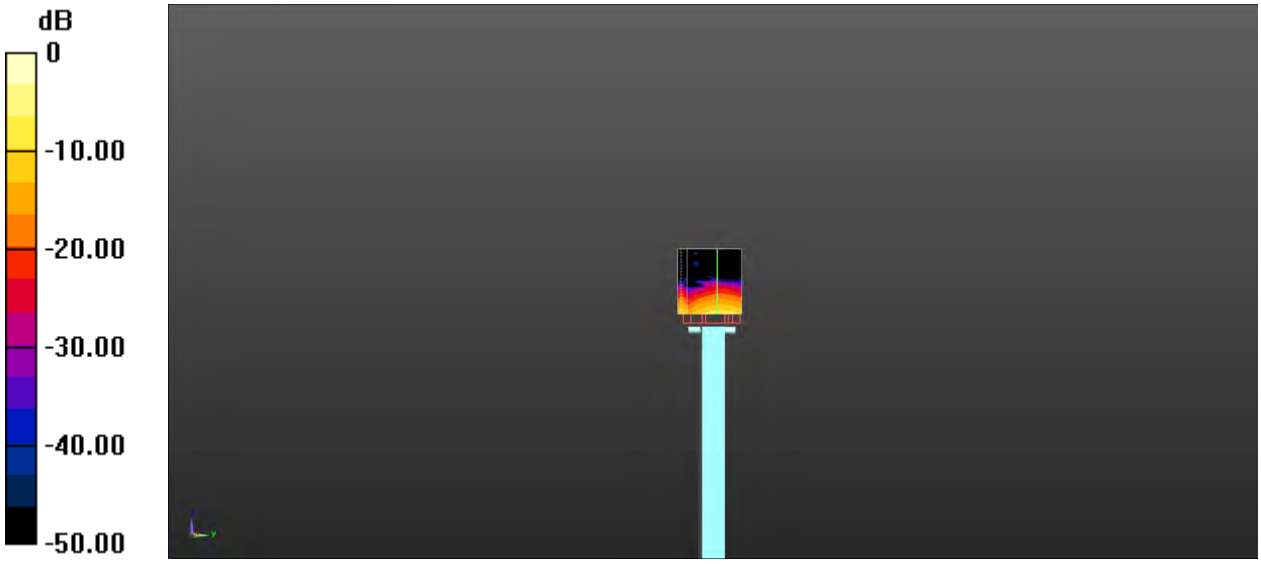
- Probe: EX3DV4 - SN7340; ConvF(5.33, 5.33, 5.33); ConvF(4.70, 4.70, 4.70); ConvF(4.68, 4.68, 4.68);
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1454;
- Phantom: SAM (30deg probe tilt) with CRP v5.0 on left 1859; Type: QD000P40CD; Serial: TP:1859
- Measurement SW: DASY52,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



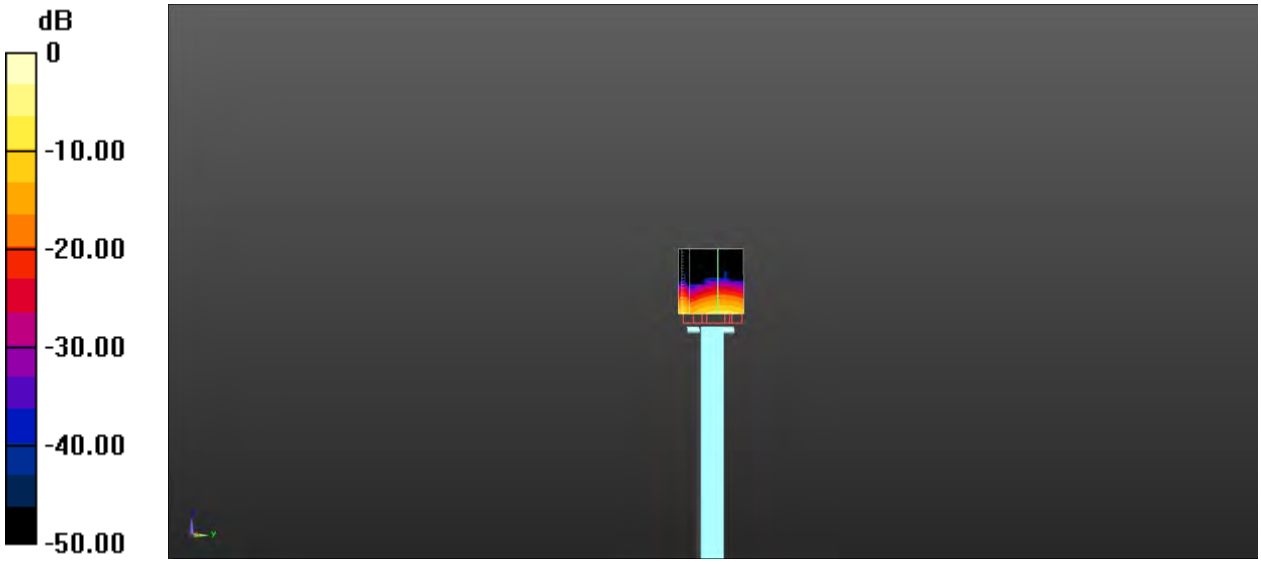
0 dB = 9.48 W/kg = 9.77 dBW/kg

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



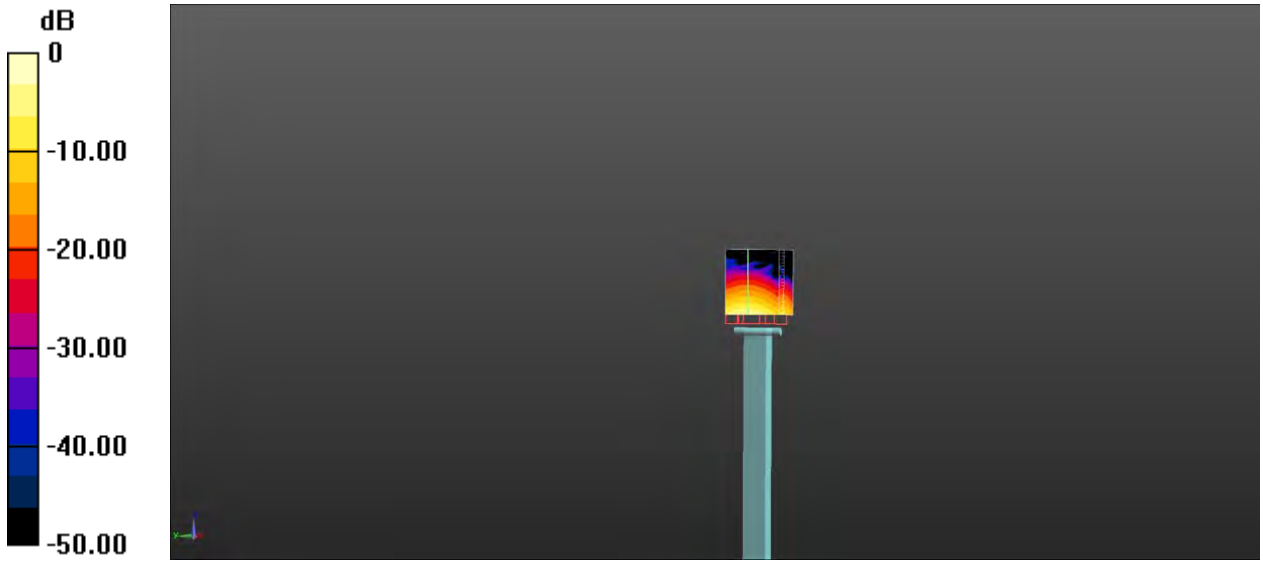
0 dB = 8.19 W/kg = 9.13 dBW/kg

4.7.2 Dipole 5 GHz Validation Measurement for Body Tissue

Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2-SN: 1200
Date/Time: 11/25/2016
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; σ = 5.41 S/m; ε_r = 48.93; ρ = 1000 kg/m^3 , Medium parameters used: f = 5600 MHz; σ = 5.74 S/m; ε_r = 47.08; ρ = 1000 kg/m^3, Medium parameters used: f = 5800 MHz; σ = 5.91 S/m; ε_r = 46.83; ρ = 1000 kg/m^3
Phantom section: Flat Section
Ambient Temperature:22.7 Liquid Temperature:21.5
DASY5 Configuration:

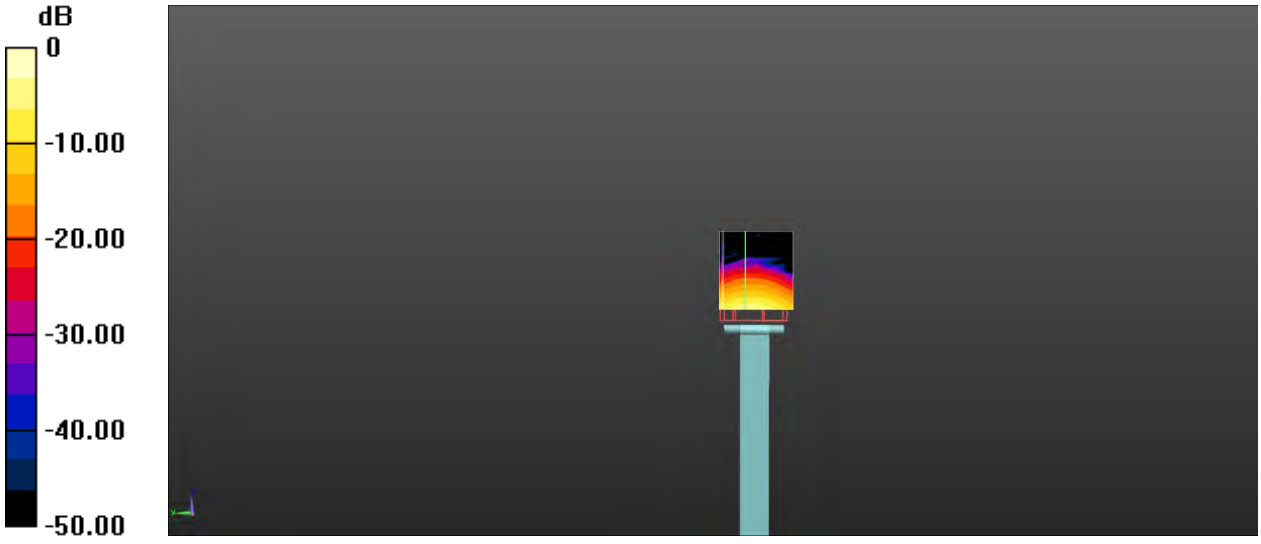
- Probe: EX3DV4 - SN7340; ConvF(4.56, 4.56, 4.56);ConvF(3.98, 3.98, 3.98); ConvF(4.15, 4.15, 4.15);
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1454;
- Phantom: SAM (30deg probe tilt) with CRP v5.0 on left 1859; Type: QD000P40CD; Serial: TP:1859
- Measurement SW: DASY52,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



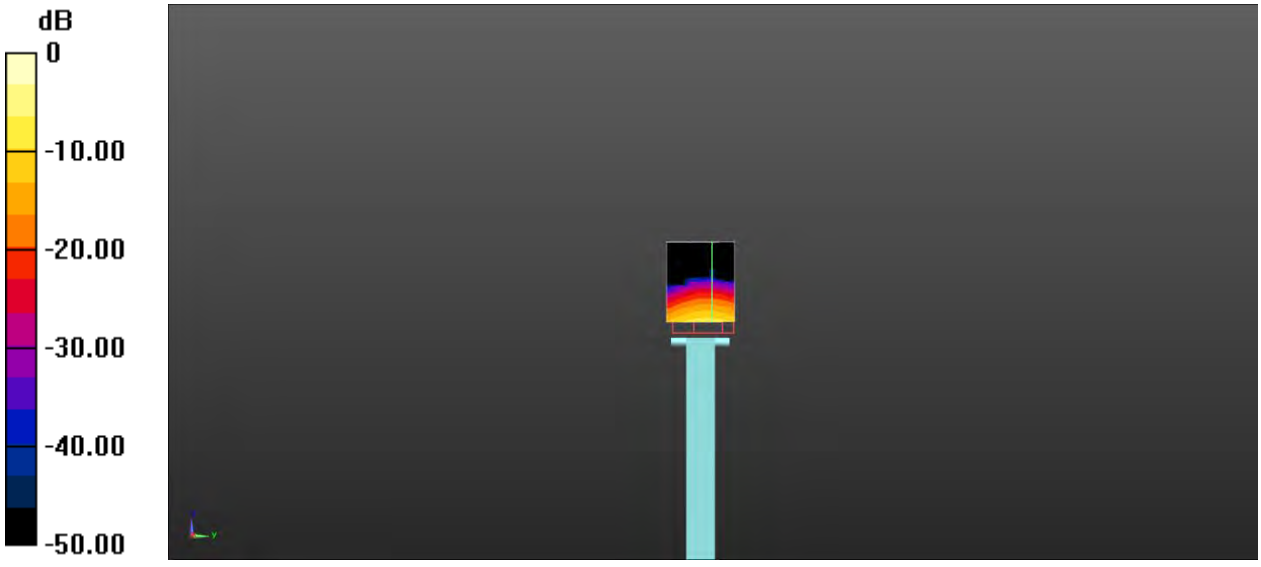
0 dB = 9.92 W/kg = 9.97 dBW/kg

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--