Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	54.4Ω + 5.8 jΩ
Return Loss	- 23.0dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.6Ω + 7.0 jΩ
Return Loss	- 22.4dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.883 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	October 4, 2001

DASY4 Validation Report for Head TSL

Date/Time: 26.10.2009 9:20:41

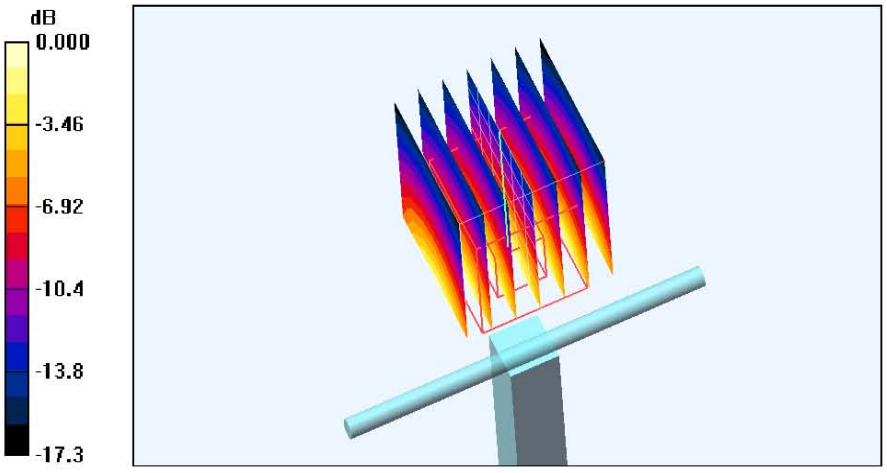
Test laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; serial: D1900V2-SN: 541

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: Head 1900 MHz;
Medium parameters used: f=1900 MHz; σ=1.41 mho/m; ε_r=39.7; ρ= 1000kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)
DASY4 Configuration:

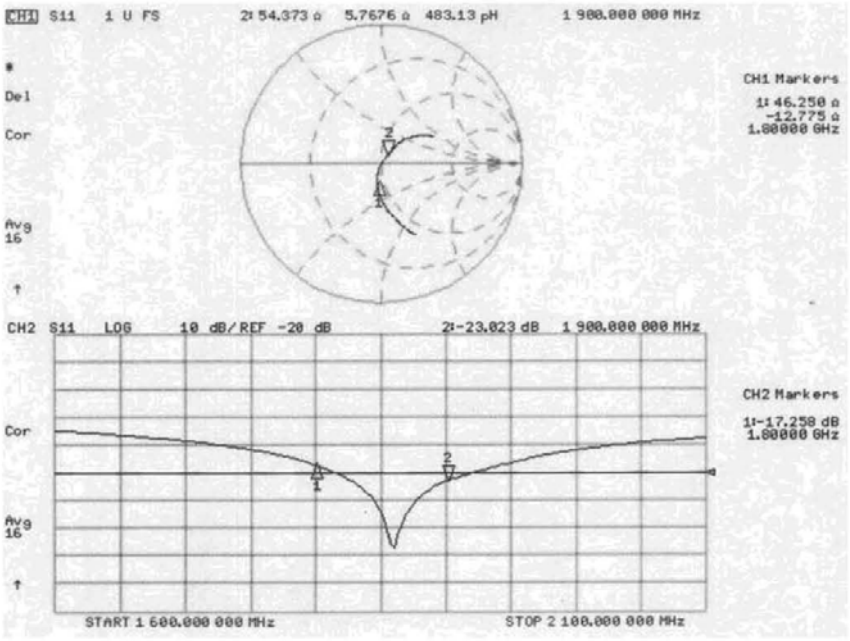
- Probe: ET3DV6-SN1507(HF); ConvF(5.03,5.03,5.03); Calibrated: 17.10.2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 28.1_2009
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA;
- Measurement SW: DASY, V4.7 Build 53; Post processing SW: SEMCAD, V1.8 Build 172

Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 85.9 V/m; Power Drift = 0.053 dB
Peak SAR (extrapolated) = 18.9 W/kg
SAR(1 g) = 9.97 mW/g; SAR(10 g) = 5.12 mW/g
Maximum value of SAR (measured) = 11.5 mW/g



0 dB = 11.5mW/g

Impedance measurement Plot for Head TSL



DASY4 Validation Report for Body TSL

Date/Time: 26.10.2009 13:18:39

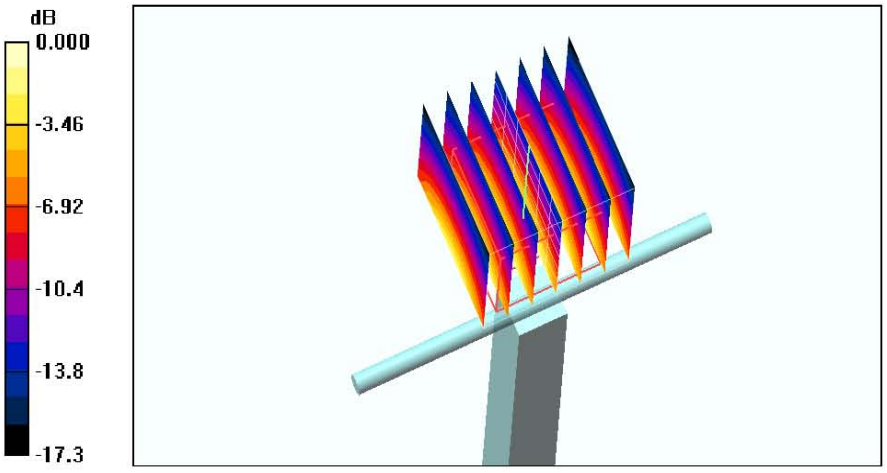
Test laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; serial: D1900V2-SN: 541

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: Body 1900 MHz;
Medium parameters used: f=1900 MHz; σ=1.51 mho/m; ε_r=52.3; ρ= 1000kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)
DASY4 Configuration:

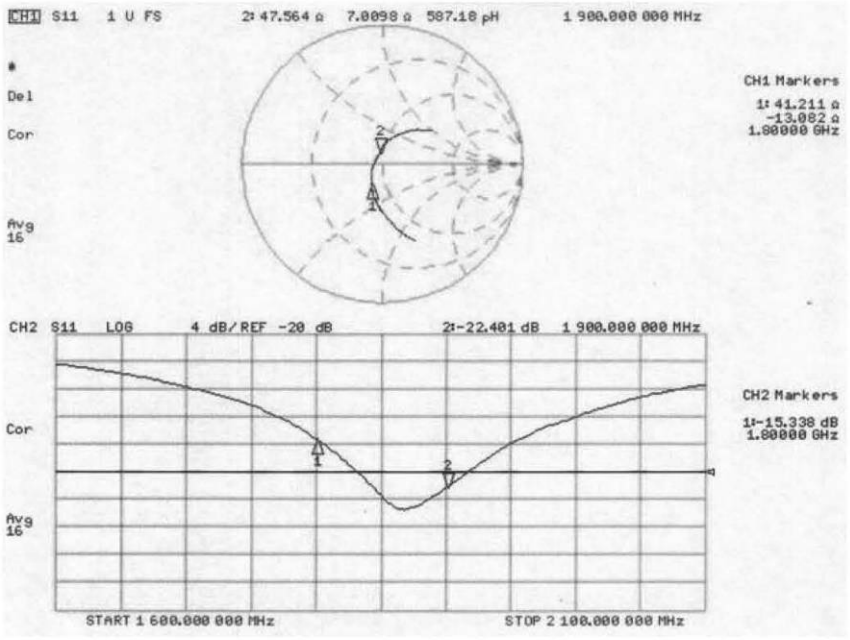
- Probe: ET3DV6-SN1507(HF); ConvF(4.61,4.61,4.61); Calibrated: 17.10.2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 28.1_2009
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA;
- Measurement SW: DASY, V4.7 Build 53; Post processing SW: SEMCAD, V1.8 Build 172

Pin = 250 mW; d = 15 mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 80.6 V/m; Power Drift = 0.047 dB
Peak SAR (extrapolated) = 19.2 W/kg
SAR(1 g) = 10.4 mW/g; SAR(10 g) = 5.29 mW/g
Maximum value of SAR (measured) = 12.1 mW/g



0 dB = 12.1mW/g

Impedance measurement Plot for Body TSL



ANNEX G DIPOLE QUALIFICATION FOR THE EXTENDED 3-YEAR CALIBRATION INTERVAL

G1 Dipole 835

The information and documentation below are provided to qualify the extended 3-year calibaration interval of dipole.

G1.1 List of Equipment

No.	Name	Type	Serial Number
01	Network analyzer	E5071C	MY46103759
02	Power meter	NRVD	101253
03	Power sensor	NRV-Z5	100333
04	Signal Generator	E4438C	MY45095825
05	Amplifier	VTL5400	0404
06	E-field Probe	SPEAG ES3DV3	3151
07	DAE	SPEAG DAE4	786
08	Dipole Validation Kit	SPEAG D835 V2	443

G1.2 Results of Impedance, Return-loss and System validation

Dipole 835 - Head

		Year			Deviation		Limit
		2009	2010	2011	2010	2011	
Impedance	Real (Ω)	52.1	53.7	52.8	1.6Ω	0.7Ω	Deviation＜ 5Ω
	Imaginary (Ω)	-3.5	-3.7	-3.6	0.2Ω	0.1Ω	Deviation＜ 5Ω
Return-loss (dB)		-25.5	-25.63	-25.69	0.13dB	0.19dB	Deviate ＜ 0.2dB
System validation	10g	1.57	1.55	1.56	-1.27%	-0.64%	Deviation＜ 10%
	1g	2.43	2.41	2.45	-0.82%	0.82%	Deviation＜ 10%

Dipole 835- Body

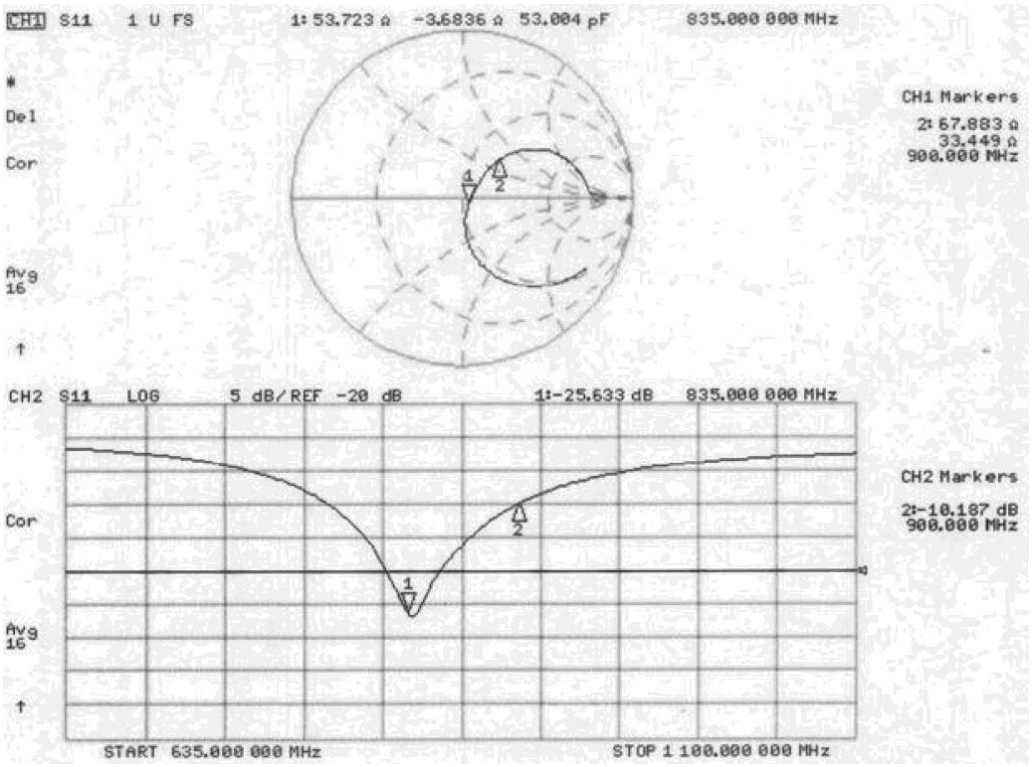
		Year			Deviation		Limit
		2009	2010	2011	2010	2011	
Impedance	Real (Ω)	49.6	49.4	49.5	0.2Ω	0.1Ω	Deviation＜ 5Ω
	Imaginary (Ω)	-5.3	-5.1	-5.0	0.2Ω	0.3Ω	Deviation＜ 5Ω
Return-loss (dB)		-25.8	-25.62	-25.68	0.18dB	0.12dB	Deviate＜ 0.2dB
System validation	10g	1.60	1.61	1.59	0.63%	-0.63%	Deviation＜ 10%
	1g	2.46	2.51	2.48	2.03%	0.81%	Deviation＜ 10%

According to the above tables, it is not necessary to recalibration the dipoles in 2010 and 2011.

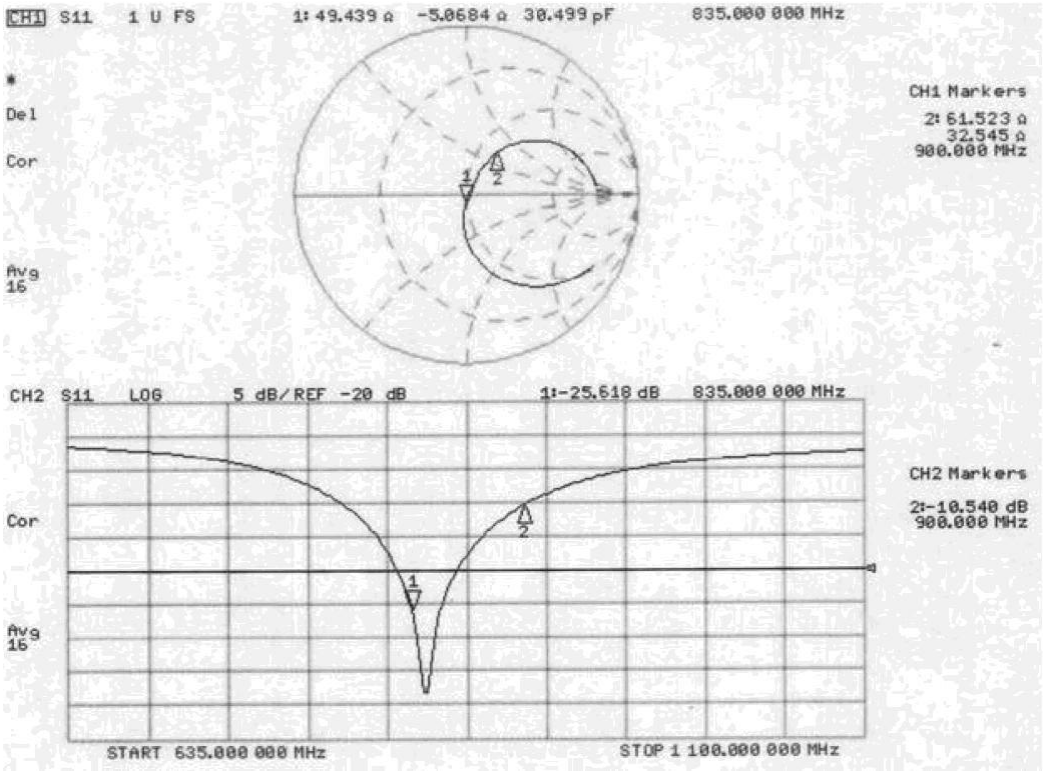
Please see below for the detail information.

G1.3 Detail Information

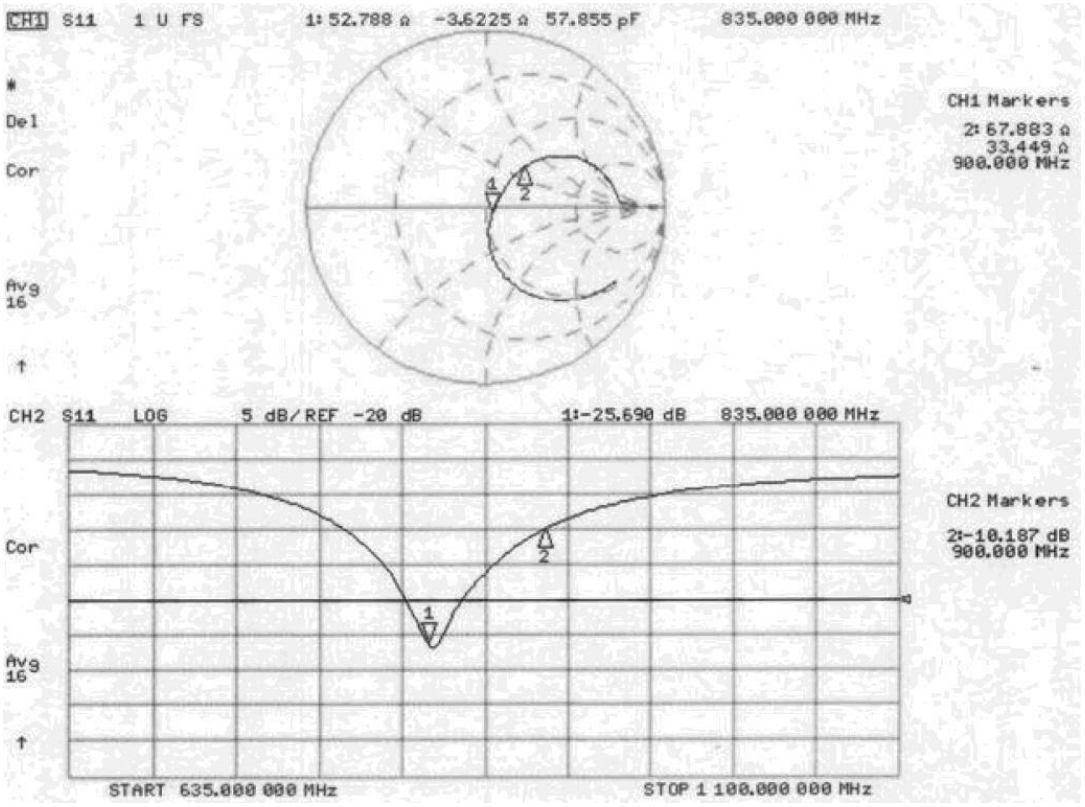
G1.3.1 Impedance Measurement Plot



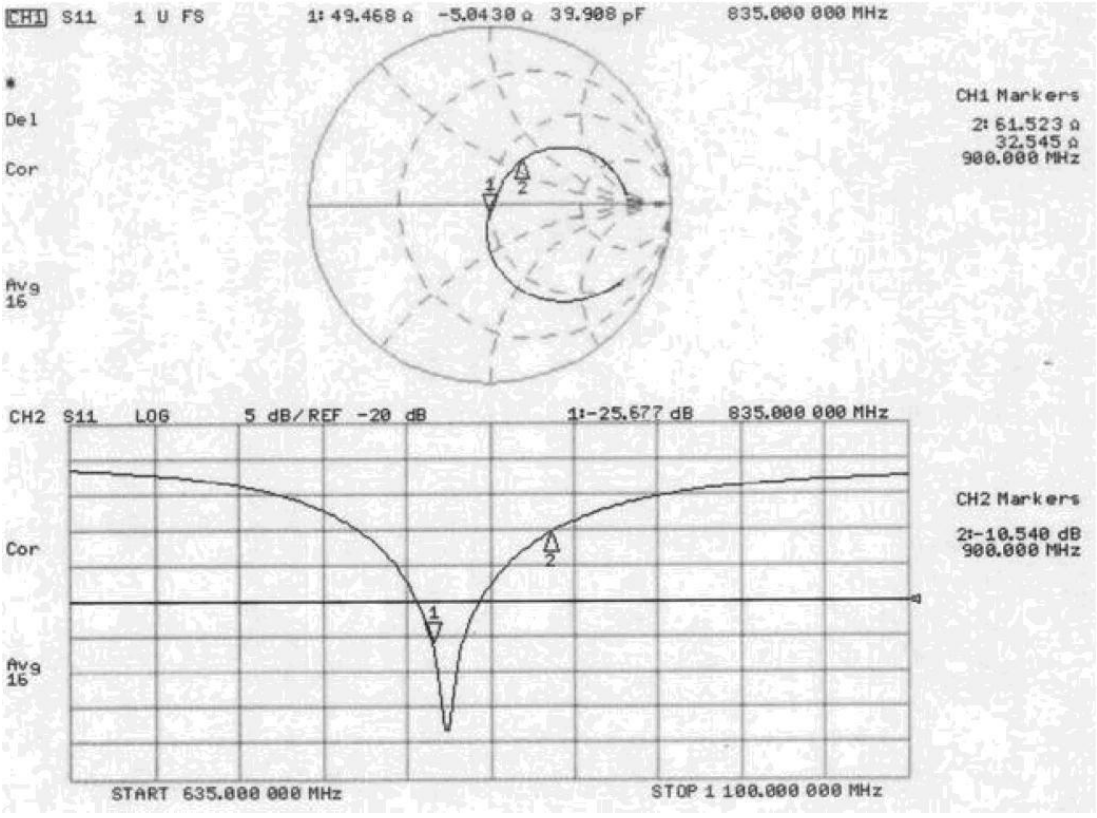
Picture G1: Impedance Measurement Plot _Dipole 835 Head _2010



Picture G2: Impedance Measurement Plot _Dipole 835 Body _2010



Picture G3: Impedance Measurement Plot _Dipole 835 Head _2011



Picture G4: Impedance Measurement Plot _Dipole 835 Body _2011

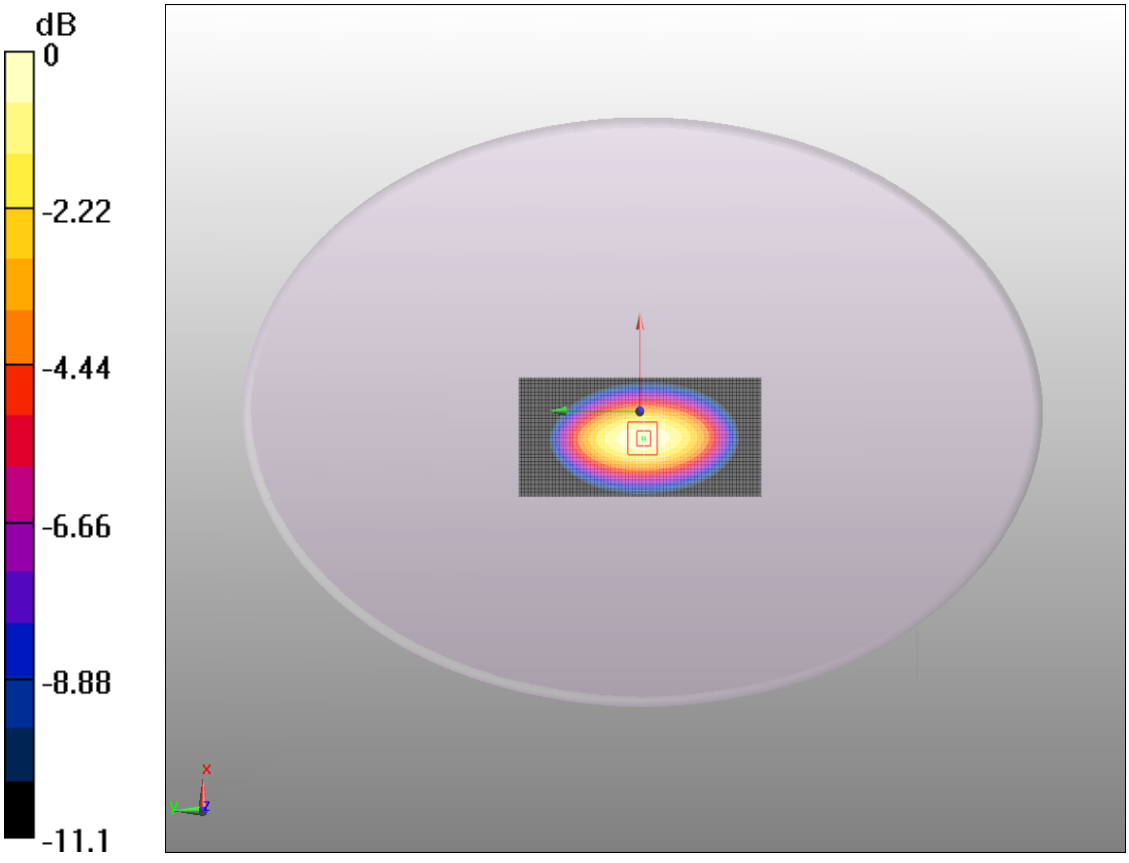
G1.3.2 System Validation Results

835 MHz

Date/Time: 2010-10-23 9:17:25 AM
Electronics: DAE4 Sn786
Medium: 850 head
Medium parameters used: f = 835 MHz; σ= 0.91 mho/m; εr = 41.7; ρ= 1000 kg/m^3
Ambient Temperature: 22.0°C Liquid Temperature: 22.0°C
Communication System: CW Frequency: 835 MHz Duty Cycle: 1:1
Probe: ES3DV3 - SN3151 ConvF (6.02, 6.02, 6.02)

System Validation/Area Scan (101x101x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 2.64 mW/g

System Validation/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 53.2 V/m; Power Drift = 0.013 dB
Peak SAR (extrapolated) = 3.57 W/kg
SAR(1 g) = 2.41 mW/g; SAR(10 g) = 1.55 mW/g
Maximum value of SAR (measured) = 2.59 mW/g



0 dB = 2.59mW/g

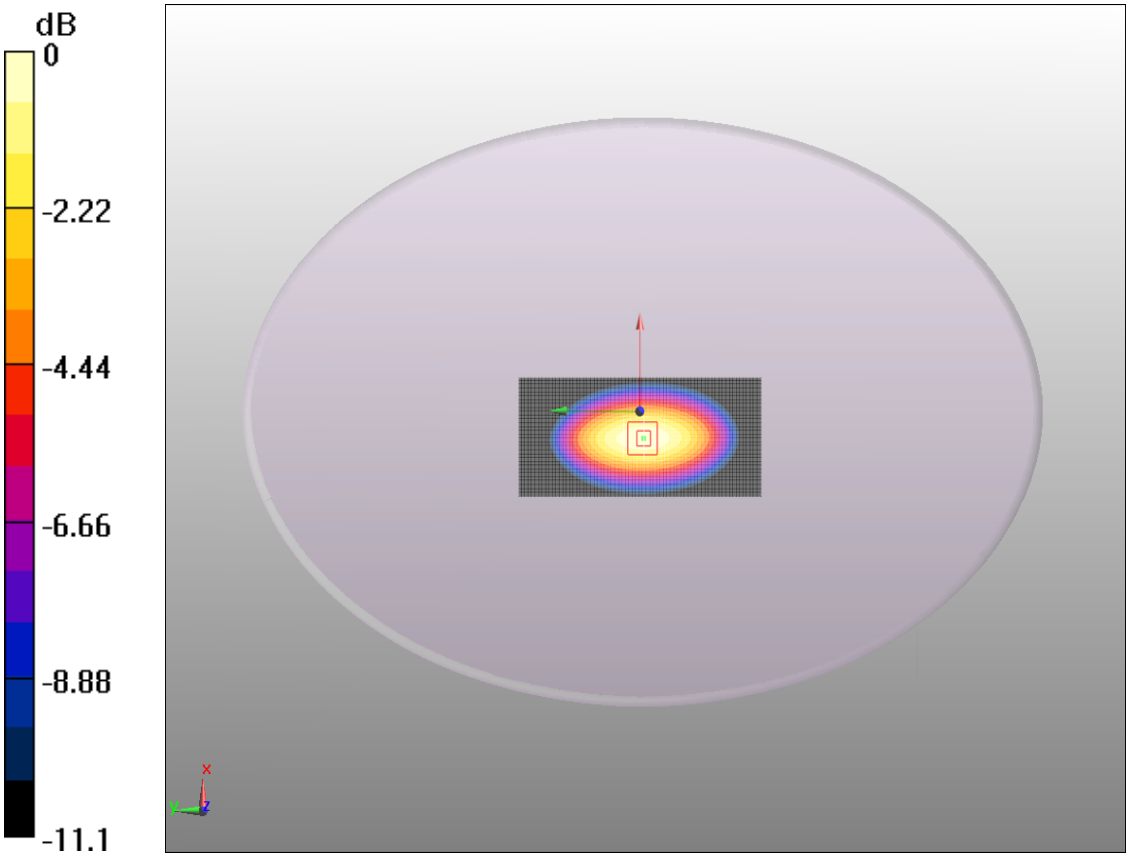
Fig.G1 validation 835MHz 250mW

835 MHz

Date/Time: 2010-10-24 11:17:25 AM
Electronics: DAE4 Sn786
Medium: 850 body
Medium parameters used: f = 835 MHz; σ= 0.98 mho/m; εr = 55.35; ρ= 1000 kg/m^3
Ambient Temperature: 22.0°C Liquid Temperature: 22.0°C
Communication System: CW Frequency: 835 MHz Duty Cycle: 1:1
Probe: ES3DV3 - SN3151 ConvF (6.02, 6.02, 6.02)

System Validation/Area Scan (101x101x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 2.55 mW/g

System Validation/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 49.3V/m; Power Drift = 0.086 dB
Peak SAR (extrapolated) = 3.46 W/kg
SAR(1 g) = 2.51 mW/g; SAR(10 g) = 1.61 mW/g
Maximum value of SAR (measured) = 2.63 mW/g



0 dB = 2.63mW/g

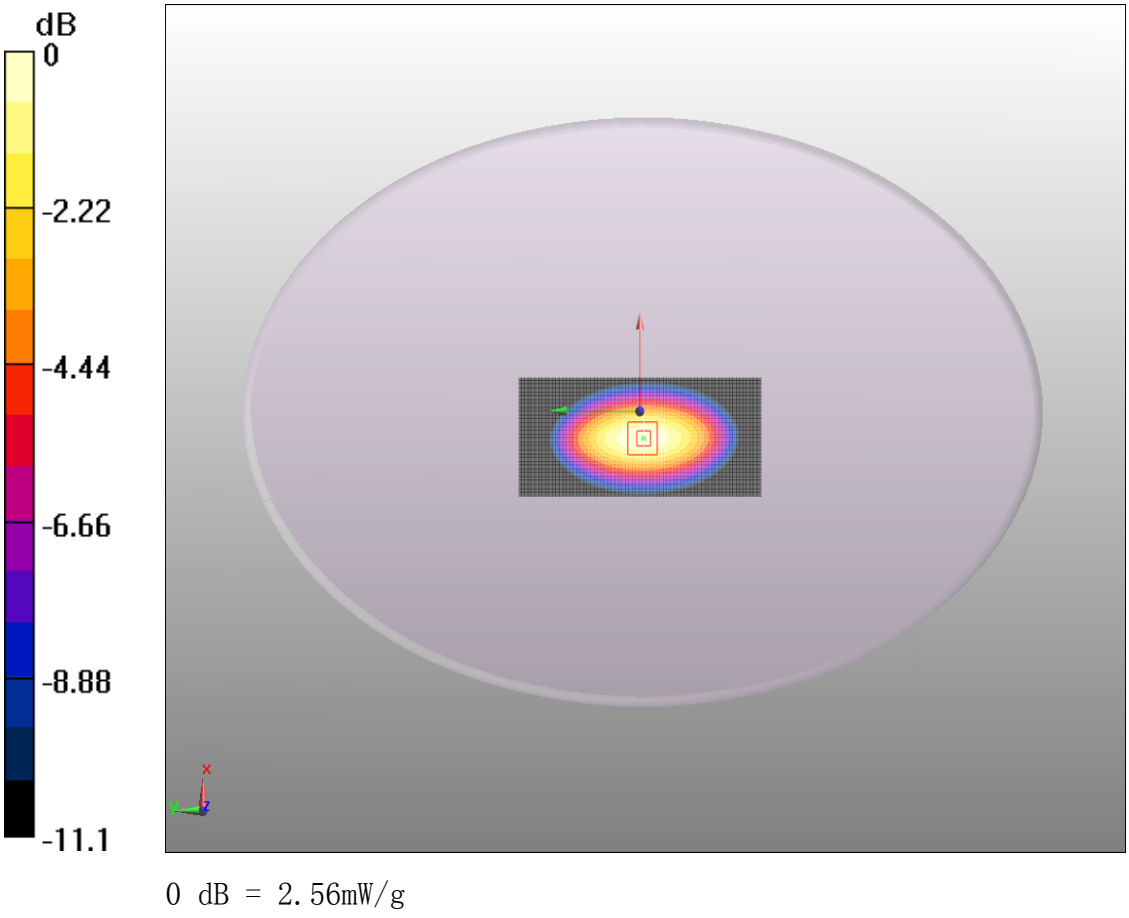
Fig.G2 validation 835MHz 250mW

835 MHz

Date/Time: 2011-10-22 08:37:24 AM
Electronics: DAE4 Sn786
Medium: 850 head
Medium parameters used: f = 835 MHz; σ= 0.92 mho/m; εr = 41.2; ρ= 1000 kg/m^3
Ambient Temperature: 23.0°C Liquid Temperature: 23.0°C
Communication System: CW Frequency: 835 MHz Duty Cycle: 1:1
Probe: ES3DV3 - SN3151 ConvF (6.02, 6.02, 6.02)

System Validation/Area Scan (101x101x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 2.55 mW/g

System Validation/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 51.2. V/m; Power Drift = 0.044 dB
Peak SAR (extrapolated) = 3.57 W/kg
SAR(1 g) = 2.45 mW/g; SAR(10 g) = 1.56 mW/g
Maximum value of SAR (measured) = 2.56 mW/g



0 dB = 2.56mW/g

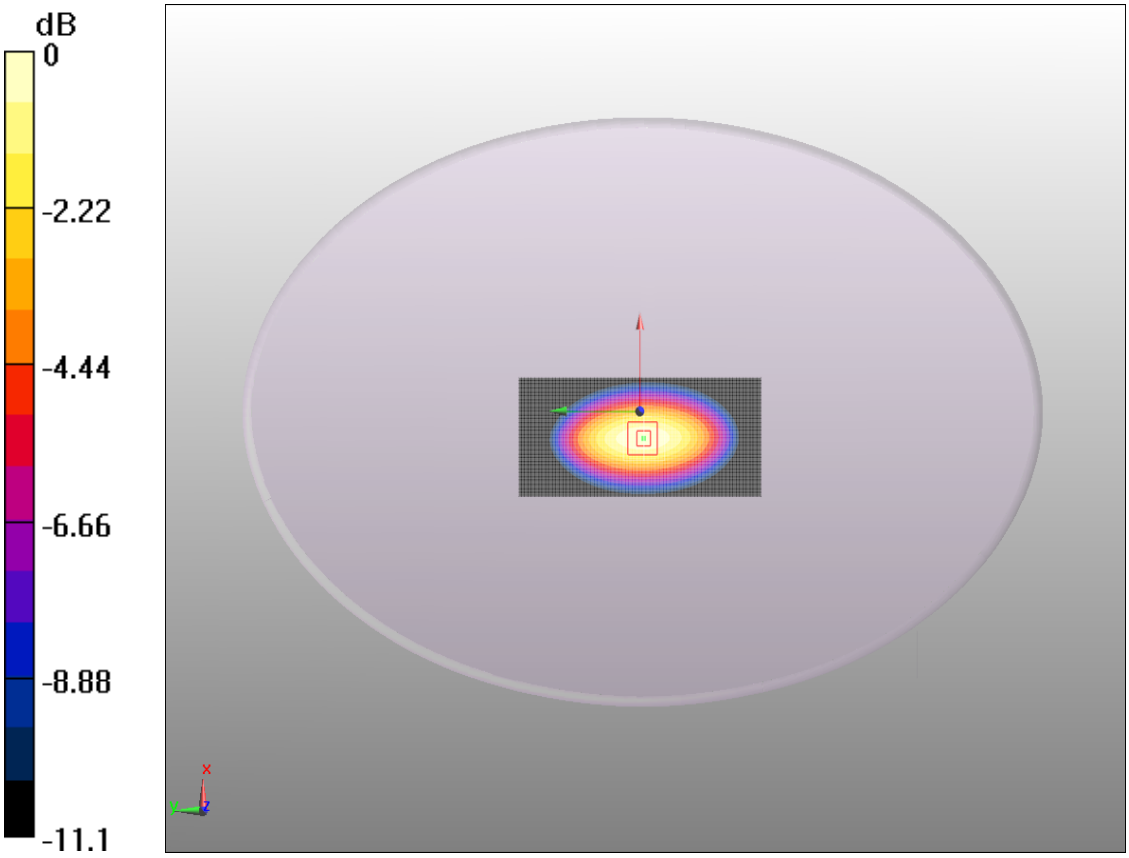
Fig.G3 validation 835MHz 250mW

835 MHz

Date/Time: 2011-10-23 10:57:25 AM
Electronics: DAE4 Sn786
Medium: 850 Body
Medium parameters used: f = 835 MHz; σ= 0.98 mho/m; εr = 53.29; ρ= 1000 kg/m^3
Ambient Temperature: 23.0°C Liquid Temperature: 23.0°C
Communication System: CW Frequency: 835 MHz Duty Cycle: 1:1
Probe: ES3DV3 - SN3151 ConvF (6.02, 6.02, 6.02)

System Validation/Area Scan (101x101x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 2.58 mW/g

System Validation/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 48.0 V/m; Power Drift = 0.053 dB
Peak SAR (extrapolated) = 3.49 W/kg
SAR(1 g) = 2.48 mW/g; SAR(10 g) = 1.59 mW/g
Maximum value of SAR (measured) = 2.66mW/g



0 dB = 2.66mW/g

Fig.G4 validation 835MHz 250mW

G2 Dipole1900

The information and documentation below are provided to qualify the extended 3-year calibaration interval of dipole.

G2.1 List of Equipment

No.	Name	Type	Serial Number
01	Network analyzer	E5071C	MY46103759
02	Power meter	NRVD	101253
03	Power sensor	NRV-Z5	100333
04	Signal Generator	E4438C	MY45095825
05	Amplifier	VTL5400	0404
06	E-field Probe	SPEAG ES3DV3	3151
07	DAE	SPEAG DAE4	786
08	Dipole Validation Kit	SPEAG D1900V2	541

G2.2 Results of Impedance, Return-loss and System validation

Dipole1900 - Head

		Year			Deviation		Limit
		2009	2010	2011	2010	2011	
Impedance	Real (Ω)	54.4	54.6	54.8	0.2Ω	0.4Ω	Deviation＜ 5Ω
	Imaginary (Ω)	5.8	5.3	5.5	0.5Ω	0.3Ω	Deviation＜ 5Ω
Return-loss (dB)		-23.02	-23.10	-23.21	0.1dB	0.19dB	Deviate＜ 0.2dB
System validation	10g	5.12	5.14	5.16	0.39%	0.78%	Deviation＜ 10%
	1g	9.97	9.98	10.1	0.1%	1.3%	Deviation＜ 10%

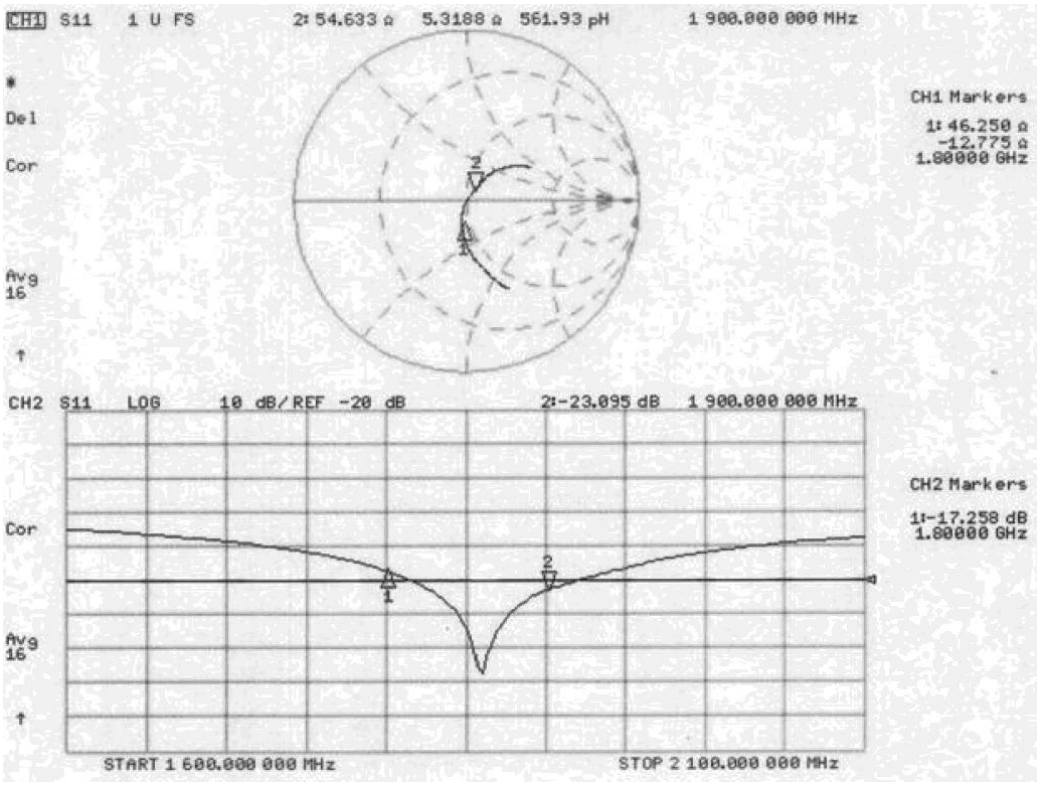
Dipole 1900 - Body

		Year			Deviation		Limit
		2009	2010	2011	2010	2011	
Impedance	Real (Ω)	47.6	47.5	47.4	0.1Ω	0.2Ω	Deviation＜ 5Ω
	Imaginary (Ω)	7.0	7.2	7.2	0.2Ω	0.2Ω	Deviation＜ 5Ω
Return-loss (dB)		-22.4	-22.28	-22.50	0.12 dB	0.10dB	Deviate＜ 0.2dB
System validation	10g	5.29	5.22	5.24	-1.32%	-0.95%	Deviation＜ 10%
	1g	10.4	10.6	10.8	1.92%	3.85%	Deviation＜ 10%

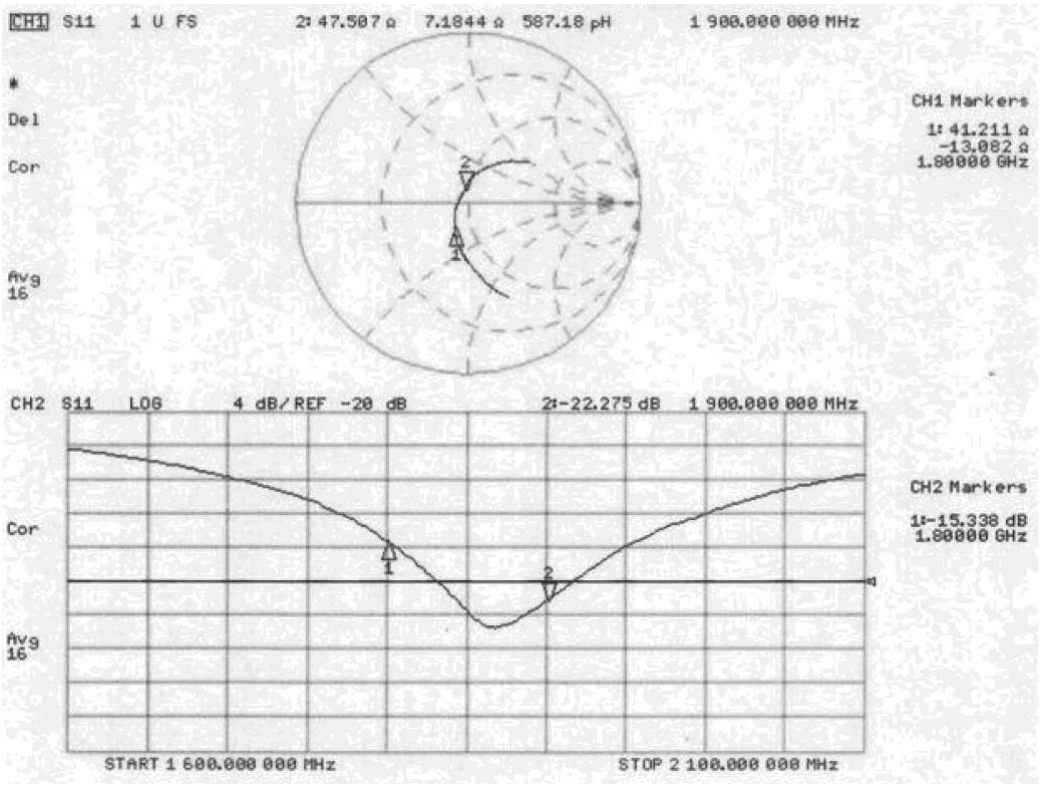
According to the above tables, it is not necessary to recalibration the dipoles in 2010 and 2011.
Please see below for the detail information.

G2.3 Detail Information

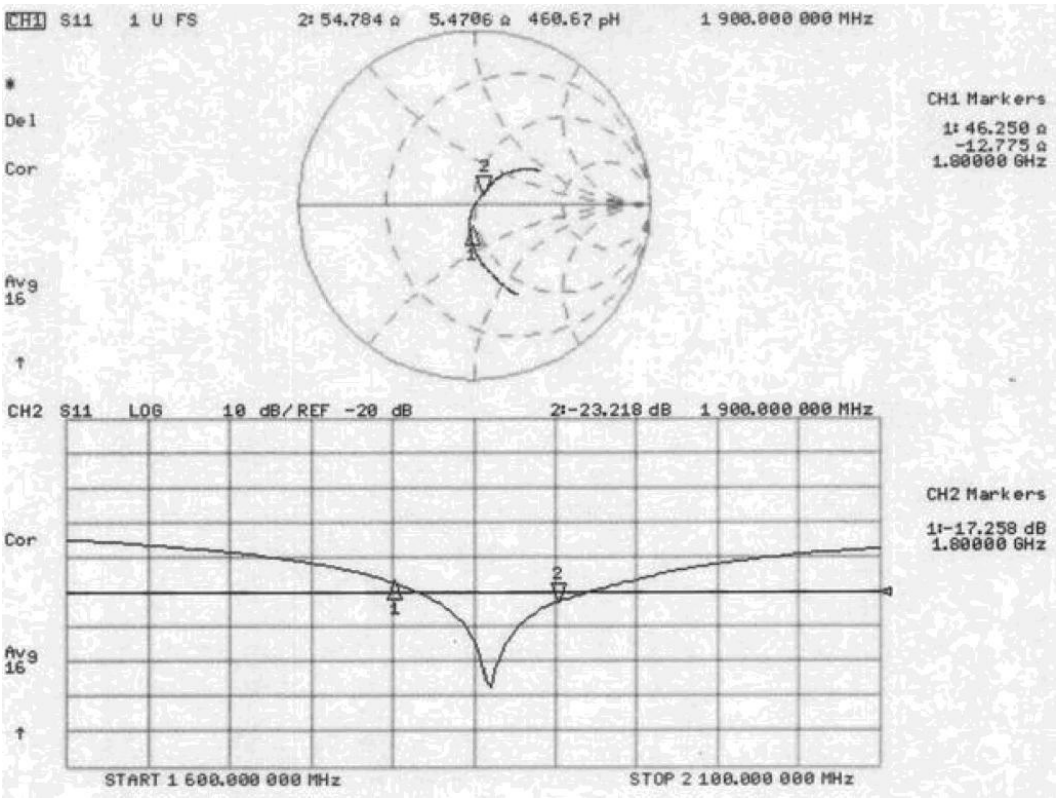
G2.3.1 Impedance Measurement Plot



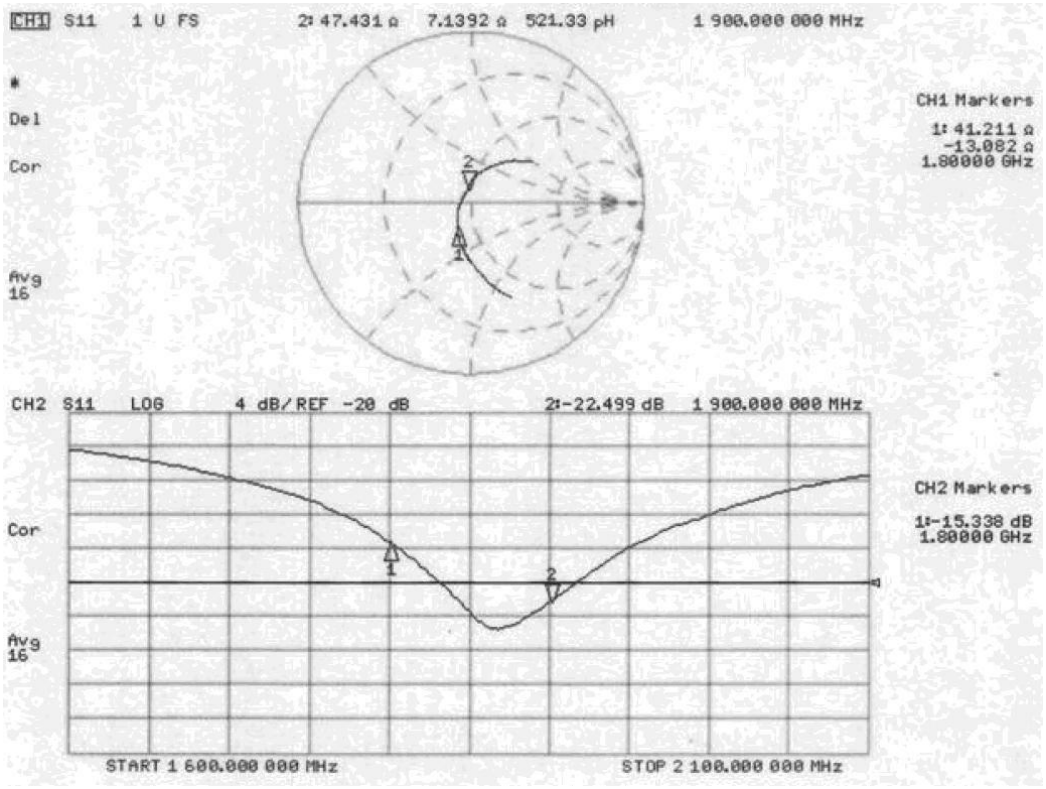
Picture G5: Impedance Measurement Plot _Dipole 1900 Head_2010



Picture G6: Impedance Measurement Plot _Dipole 1900 body_2010



Picture G7: Impedance Measurement Plot _Dipole 1900 Head_2011



Picture G8: Impedance Measurement Plot _Dipole 1900 body_2011

G2.3.2 System Validation Results

1900MHz

Date/Time: 10/25/2010 8:36:15 AM
Electronics: DAE4 Sn786
Medium: head 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.41 mho/m; εr = 40.56; ρ = 1000 kg/m^3
Ambient Temperature: 22.0°C Liquid Temperature: 22.0°C
Communication System: CW Frequency: 1900 MHz Duty Cycle: 1:1
Probe: ES3DV3 - SN3151 ConvF (4.87, 4.87, 4.87)

System Validation/Area Scan (101x101x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 11.2 mW/g
System Validation/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 92.8 V/m; Power Drift = 0.052 dB
Peak SAR (extrapolated) = 16.9 W/kg
SAR(1 g) = 9.98 mW/g; SAR(10 g) = 5.14 mW/g
Maximum value of SAR (measured) = 11.4 mW/g

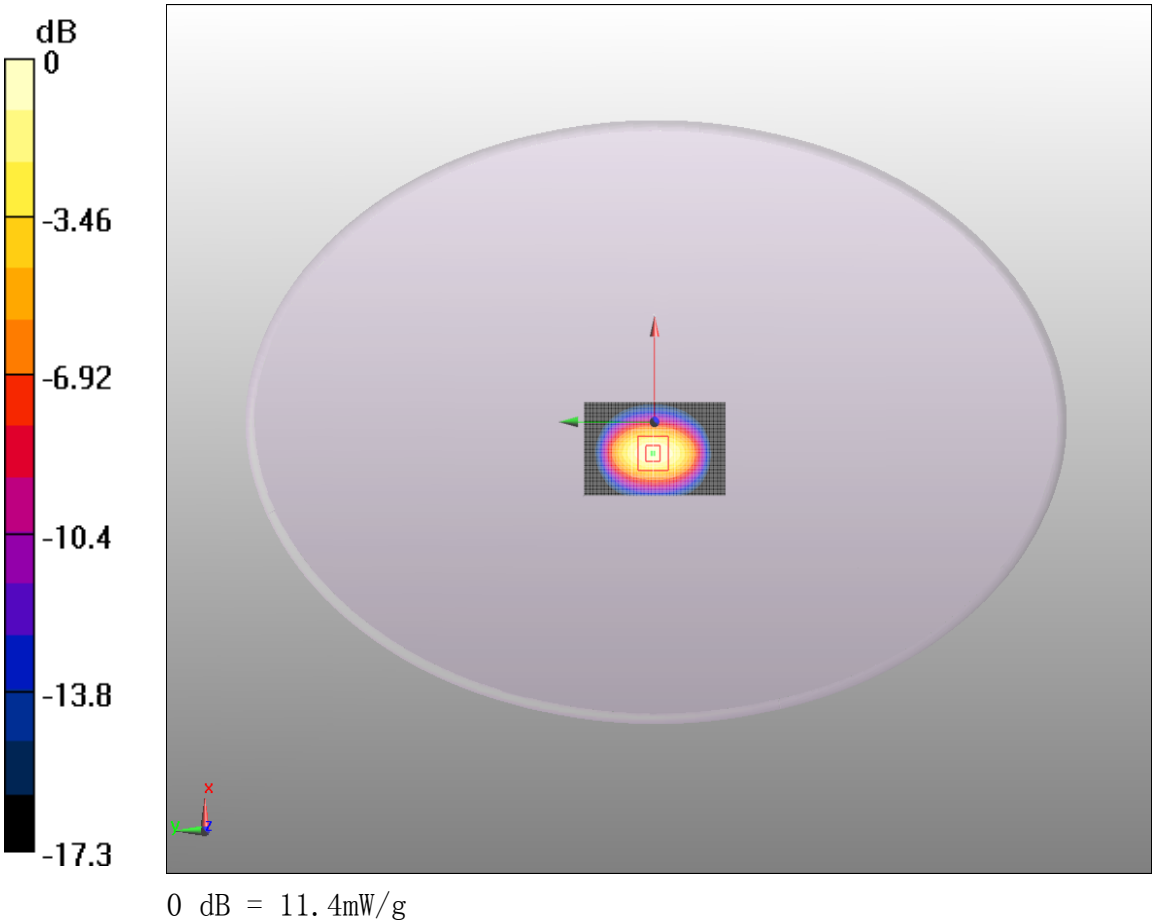
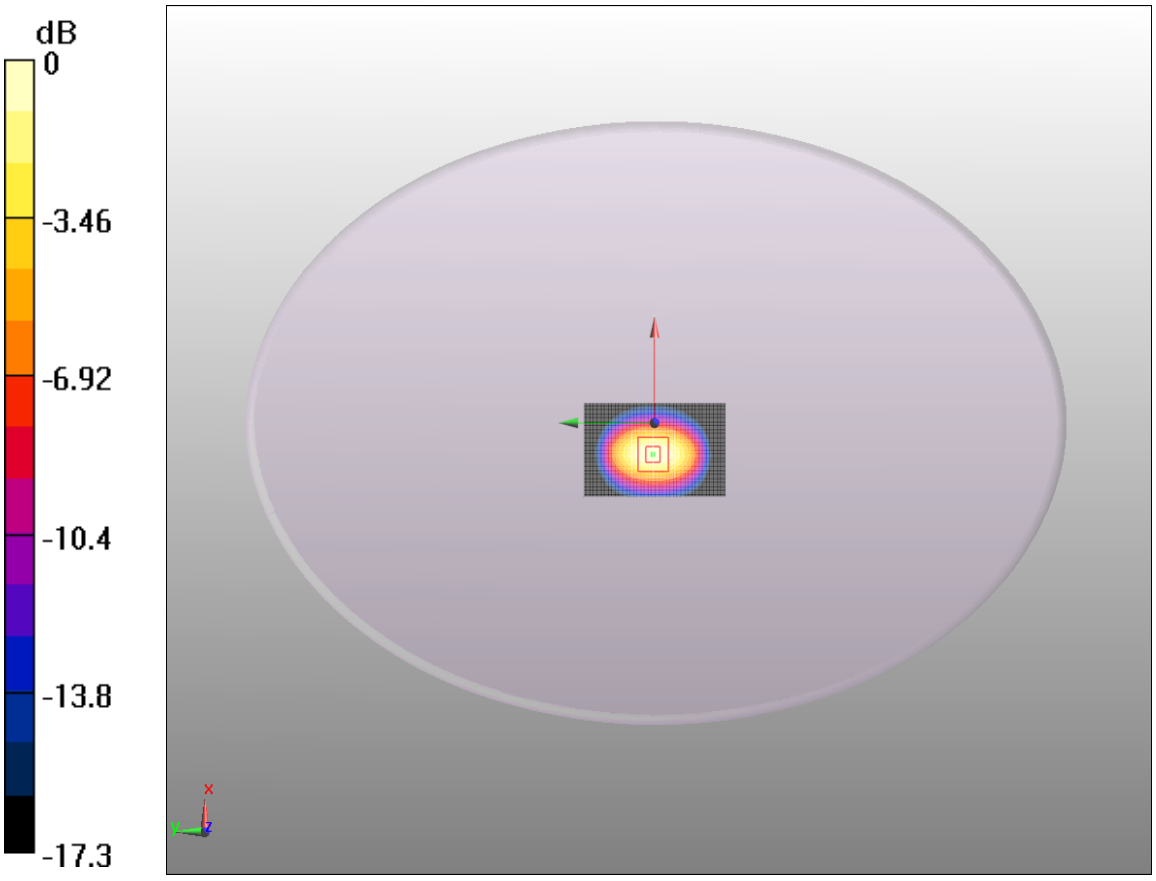


Fig.G5 validation 1900MHz 250mW

1900MHz

Date/Time: 10/25/2010 4:41:18 PM
Electronics: DAE4 Sn786
Medium: Body 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.53 mho/m; εr = 52.2; ρ = 1000 kg/m^3
Ambient Temperature: 22.0°C Liquid Temperature: 22.0°C
Communication System: CW Frequency: 1900 MHz Duty Cycle: 1:1
Probe: ES3DV3 - SN3151 ConvF (4.87, 4.87, 4.87)

System Validation/Area Scan (101x101x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 10.8 mW/g
System Validation/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 90.2 V/m; Power Drift = 0.022 dB
Peak SAR (extrapolated) = 17.1 W/kg
SAR(1 g) = 10.6 mW/g; SAR(10 g) = 5.22 mW/g
Maximum value of SAR (measured) = 11.1 mW/g



0 dB = 11.1mW/g

Fig.G6 validation 1900MHz 250mW

1900MHz

Date/Time: 10/24/2011 8:56:15 AM
Electronics: DAE4 Sn786
Medium: head 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.44 mho/m; εr = 40.65; ρ = 1000 kg/m^3
Ambient Temperature: 23.0°C Liquid Temperature: 23.0°C
Communication System: CW Frequency: 1900 MHz Duty Cycle: 1:1
Probe: ES3DV3 - SN3151 ConvF (4.87, 4.87, 4.87)

System Validation/Area Scan (101x101x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 10.6 mW/g
System Validation/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 94.4 V/m; Power Drift = 0.019 dB
Peak SAR (extrapolated) = 16.9 W/kg
SAR(1 g) = 10.1 mW/g; SAR(10 g) = 5.16 mW/g
Maximum value of SAR (measured) = 10.9 mW/g

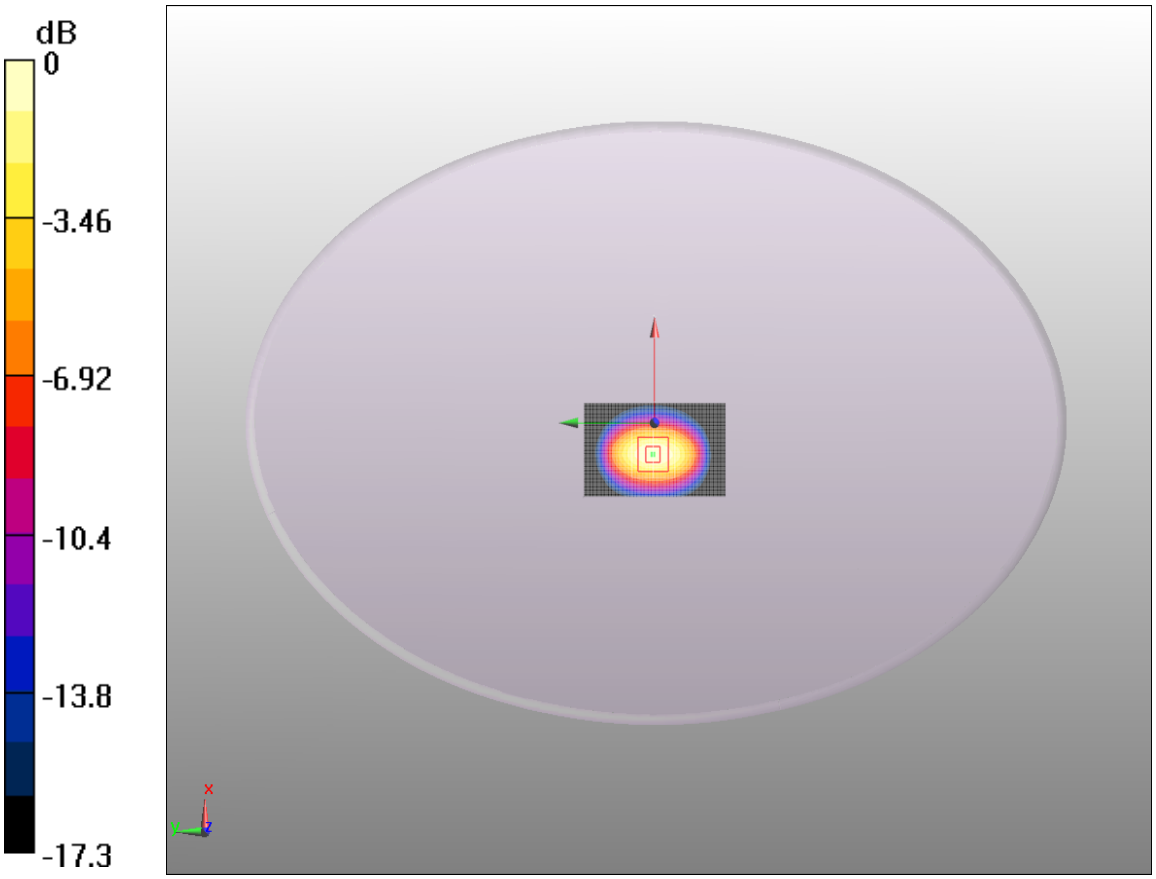
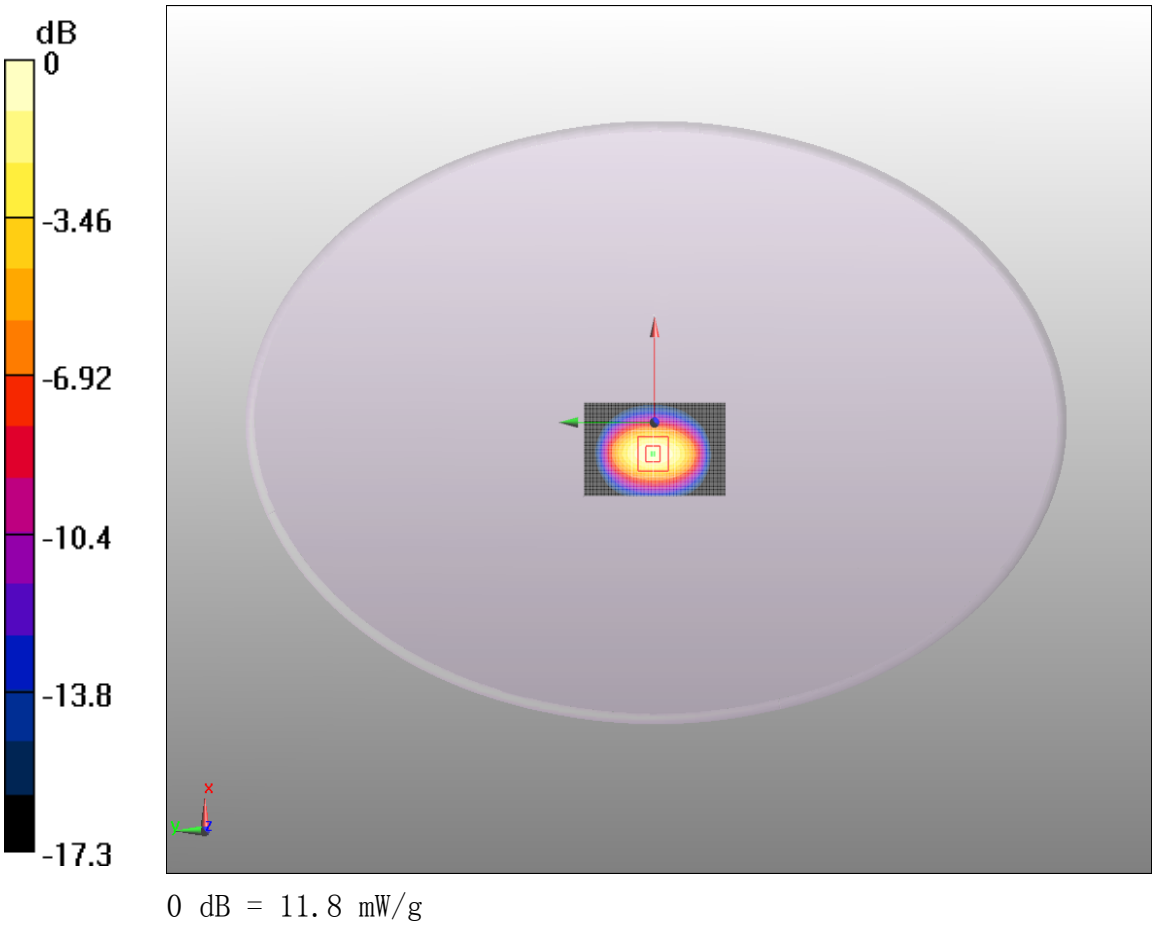


Fig.G7 validation 1900MHz 250Mw

1900MHz

Date/Time: 10/24/2011 4:51:12 PM
Electronics: DAE4 Sn786
Medium: Body 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.54 mho/m; εr = 52.5; ρ = 1000 kg/m^3
Ambient Temperature: 23.0°C Liquid Temperature: 23.0°C
Communication System: CW Frequency: 1900 MHz Duty Cycle: 1:1
Probe: ES3DV3 - SN3151 ConvF (4.87, 4.87, 4.87)

System Validation/Area Scan (101x101x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 11.8 mW/g
System Validation/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 89.5 V/m; Power Drift = 0.052 dB
Peak SAR (extrapolated) = 16.8 W/kg
SAR(1 g) = 10.8 mW/g; SAR(10 g) = 5.24 mW/g
Maximum value of SAR (measured) = 11.8 mW/g



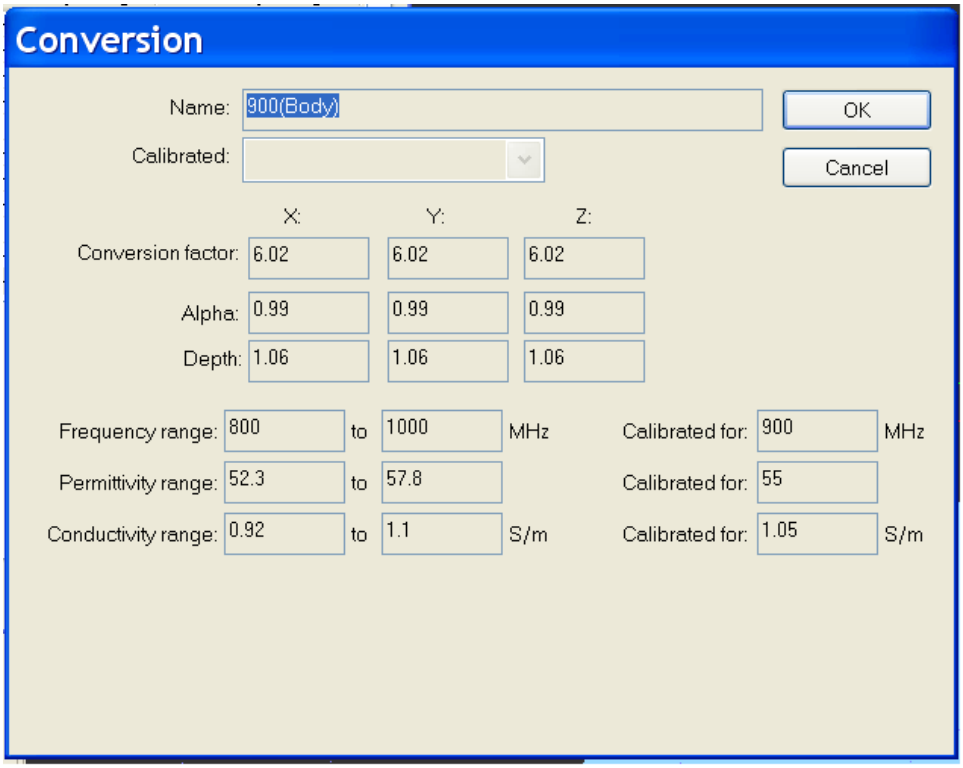
0 dB = 11.8 mW/g

Fig.G8 validation 1900MHz 250mW

ANNEX H Analysis of Effective Frequency Interval of Probe

ANNEX H.1 835 MHz_10/31/2011

The test frequencies are properly matched as this is GSM850/WCDMA850. The probe calibration for permittivity and conductivity is within ±5%, were the probe calibrated centre frequency at 900MHz has permittivity and conductivity of 55.0 and 1.05 respectively. At the probe extreme frequencies the following are true: at 800 MHz the permittivity and conductivity are 52.3 and 0.92 respectively. At 1000 MHz the permittivity and conductivity are 57.8 and 1.1 respectively. The probe was calibrated at these parameters in order to cover the frequency range 800 MHz to 1000 MHz.



The target permittivity and conductivity at 835 MHz is 55.2 and 0.97 respectively which is within the calibrated range of the probe parameter.

The following parameters are declared in the probe calibration certificate on page 8:

f[MHz]	Validity[MHz][C]	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF	Uncertainty
450	±50 /±100	Head	43.5±5%	0.87±5%	0.82	1.44	7.42	±13.3% (k=2)
900	±50 /±100	Head	41.5±5%	0.97±5%	0.80	1.29	6.23	±11.0% (k=2)
1810	±50 /±100	Head	40.0±5%	1.40±5%	0.61	1.57	5.08	±11.0% (k=2)
1900	±50 /±100	Head	40.0±5%	1.40±5%	0.63	1.44	4.98	±11.0% (k=2)
2100	±50 /±100	Head	39.8±5%	1.49±5%	0.66	1.34	4.58	±11.0% (k=2)
900	±50 /±100	Body	55.0±5%	1.05±5%	0.99	1.06	6.02	±11.0% (k=2)
1810	±50 /±100	Body	53.3±5%	1.52±5%	0.75	1.34	4.87	±11.0% (k=2)
1900	±50 /±100	Body	53.3±5%	1.52±5%	0.62	1.47	4.73	±11.0% (k=2)
2100	±50 /±100	Body	53.5±5%	1.57±5%	0.68	1.34	4.35	±11.0% (k=2)
2450	±50 /±100	Body	52.7±5%	1.95±5%	0.60	1.40	3.72	±11.0% (k=2)

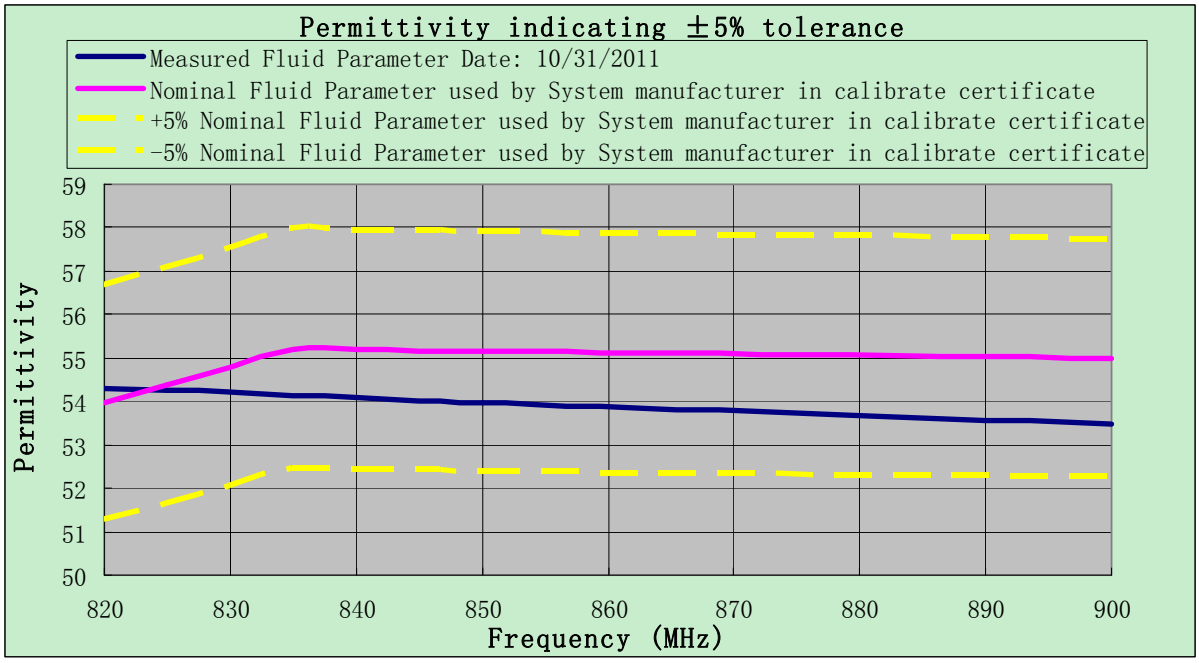
The system manufacturer has carried out addition steps as detailed on page 4 of KDB 450824.

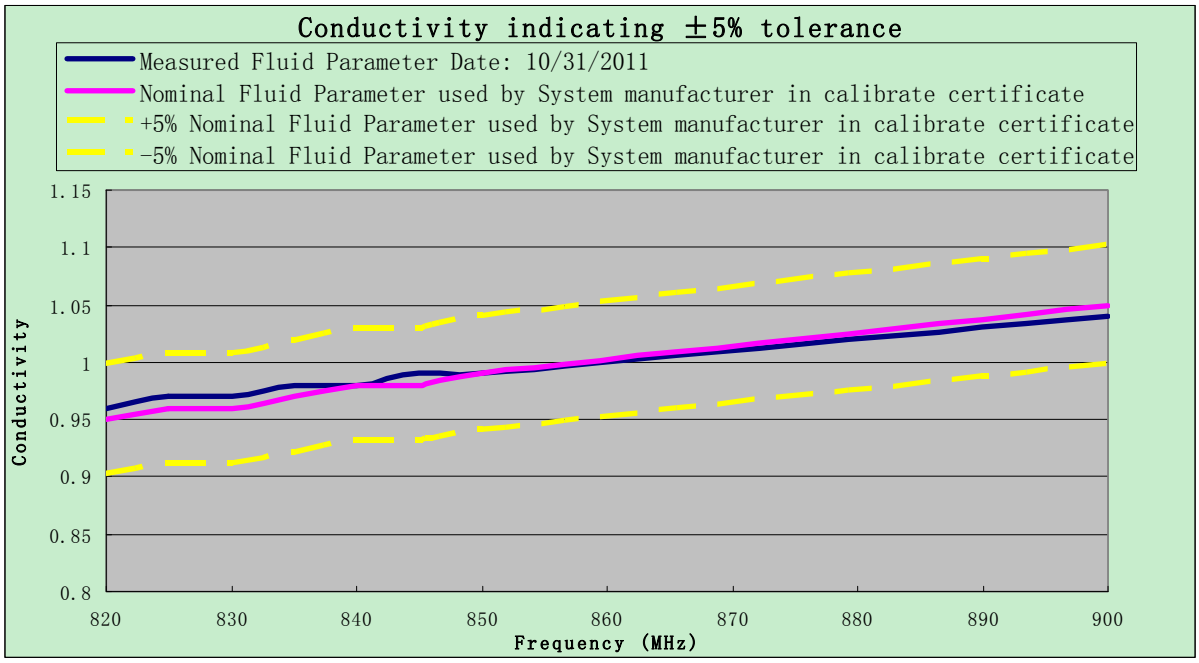
This is detailed in the calibration certificates. The measured SAR values in the report are all below 10% of the SAR limit.

The measured fluid dielectric parameters for 835 MHz, performed during test values were all within ±5% of the 835 MHz target value.

At 900 MHz, the probe was calibrated and validation performed, the tissue dielectric parameter measured for routine measurements at 900 MHz was less than the target parameter for 835 MHz ε_r and higher than the target parameter for 835 MHz σ.

/	Measured Fluid Parameter Date : 12/22/2011		Nominal Fluid Parameter used by System manufacturer in calibrate certificate	
Frequency (MHz)	ε_r	σ	ε_r	σ
820	54.31	0.96	53.96	0.95
825	54.24	0.97	54.37	0.96
830	54.2	0.97	54.79	0.96
835	54.13	0.98	55.2	0.97
840	54.09	0.98	55.18	0.98
845	54.02	0.99	55.17	0.98
850	53.98	0.99	55.15	0.99
900	53.48	1.04	55.00	1.05





The probe conversion factor and its frequency response, with respect to the tissue dielectric media used during the probe calibration and routine measurements was examined to determine if the effective frequency interval is adequate for the intended measurements to satisfy protocol requirements. The frequency range at which the probe was calibrated for 900 MHz covered 800 MHz to 1000 MHz and the dielectric parameters required for 824 to 840 MHz were all within the calibrated range of the probe dielectric parameters.