



## Appendix H - Analysis of Effective Frequency Interval of Probe

The test frequencies are properly matched as this is a cellular band. The probe calibration for permittivity and conductivity is within  $\pm 5\%$ , were the probe calibrated centre frequency at 900 MHz 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.

**Conversion**

Name: <input type="text" value="900 (Body)"/>	<input type="button" value="OK"/>			
X: <input type="text" value="5.91"/>	Y: <input type="text" value="5.91"/>	Z: <input type="text" value="5.91"/>		
Conversion factor: <input type="text" value="5.91"/>	<input type="button" value="Cancel"/>			
Alpha: <input type="text" value="0.31"/>	<input type="text" value="0.31"/>	<input type="text" value="0.31"/>		
Delta: <input type="text" value="2.98"/>	<input type="text" value="2.98"/>	<input type="text" value="2.98"/>		
Frequency range: <input type="text" value="800"/>	to <input type="text" value="1000"/>	MHz	Calibrated for: <input type="text" value="900"/>	MHz
Permittivity range: <input type="text" value="52.3"/>	to <input type="text" value="57.8"/>		Calibrated for: <input type="text" value="55"/>	
Conductivity range: <input type="text" value="0.92"/>	to <input type="text" value="1.1"/>	S/m	Calibrated for: <input type="text" value="1.05"/>	S/m

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] <sup>c</sup>	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF	Uncertainty
900	± 50 / ± 100	Head	41.5 ± 5%	0.97 ± 5%	0.30	2.80	6.06	± 11.0% (k=2)
1750	± 50 / ± 100	Head	40.1 ± 5%	1.37 ± 5%	0.53	2.11	5.36	± 11.0% (k=2)
1950	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.59	1.96	5.01	± 11.0% (k=2)
2450	± 50 / ± 100	Head	39.2 ± 5%	1.80 ± 5%	0.77	1.57	4.49	± 11.0% (k=2)
900	± 50 / ± 100	Body	55.0 ± 5%	1.05 ± 5%	0.31	2.98	5.91	± 11.0% (k=2)
1750	± 50 / ± 100	Body	53.4 ± 5%	1.49 ± 5%	0.60	2.20	4.73	± 11.0% (k=2)
1950	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.68	1.95	4.49	± 11.0% (k=2)
2450	± 50 / ± 100	Body	52.7 ± 5%	1.95 ± 5%	0.90	1.51	3.79	± 11.0% (k=2)

<sup>c</sup> The validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2). The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

Certificate No: ET3-1787\_Aug08

Page 8 of 9

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.

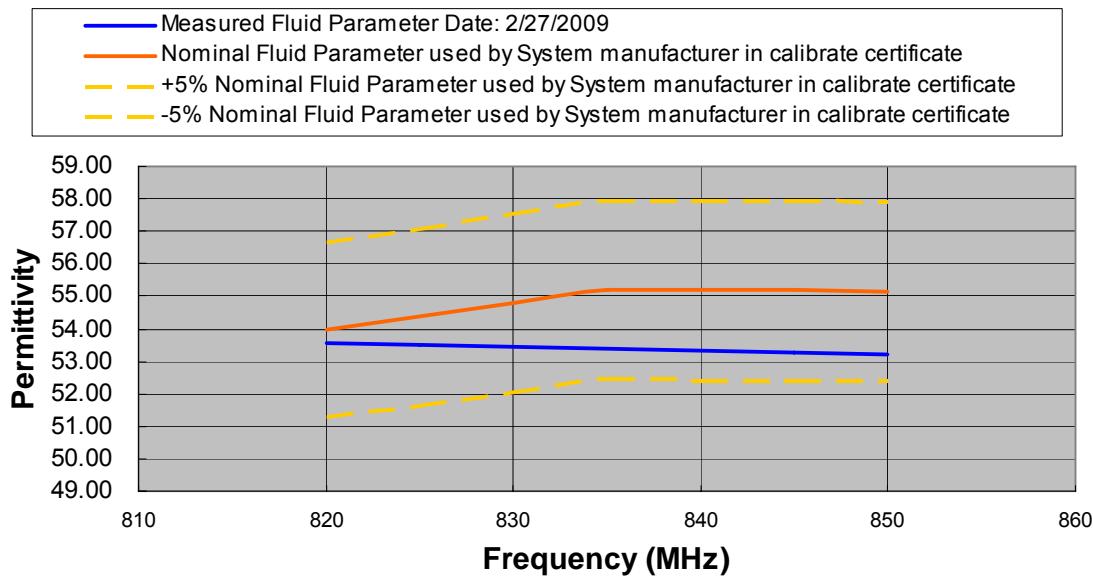
The measured fluid dielectric parameters for 835 MHz, performed during test values were all within ±5% of the 835 MHz target value.

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  $\epsilon_r$  and higher than the target parameter for 835 MHz  $\sigma$ .



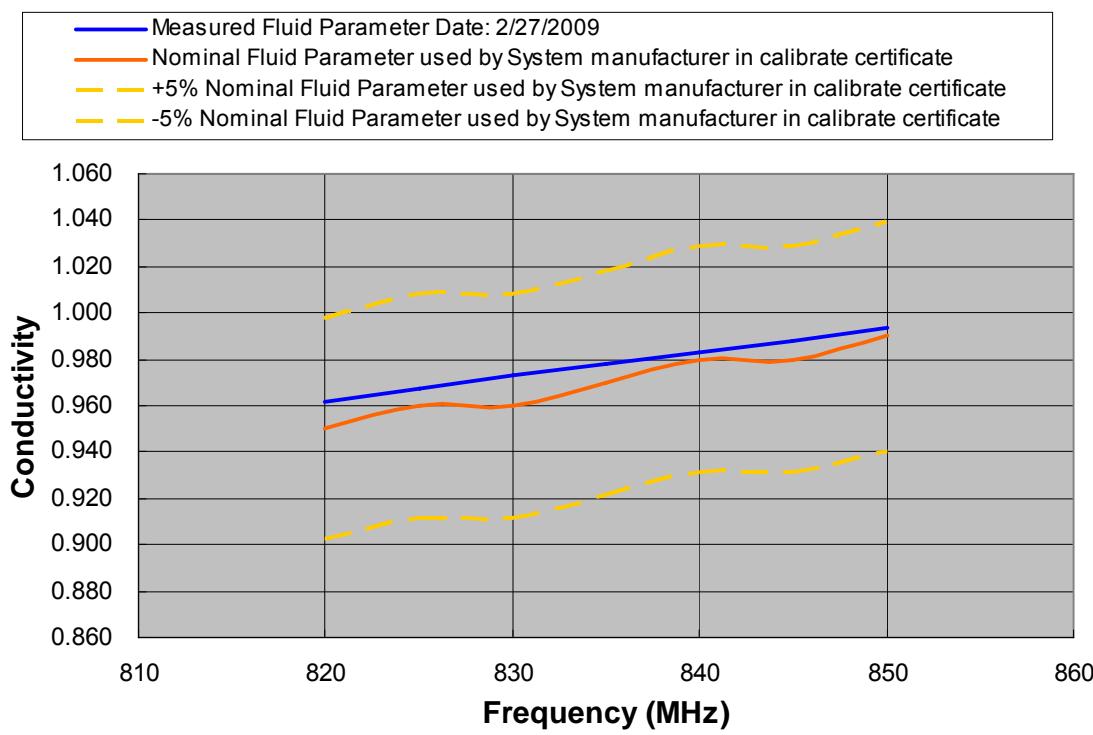
		Measured Fluid Parameter Date: 2/27/2009		Nominal Fluid Parameter used by System manufacturer in calibrate certificate	
Frequency (MHz)	$\epsilon_r$	$\sigma$	$\epsilon_r$	$\sigma$	
820	53.57	0.962	53.96	0.95	
825	53.51	0.967	54.37	0.96	
830	53.46	0.973	54.79	0.96	
835	53.39	0.978	55.20	0.97	
840	53.32	0.983	55.18	0.98	
845	53.27	0.988	55.17	0.98	
850	53.22	0.994	55.15	0.99	
900	52.68	1.051	55.00	1.05	

### Permittivity indicating $\pm 5\%$ tolerance





### Conductivity indicating $\pm 5\%$ tolerance



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.



**Conversion**

Name: 900 (Body)			OK
X:	Y:	Z:	Cancel
Conversion factor: 5.91	5.91	5.91	
Alpha: 0.31	0.31	0.31	
Delta: 2.98	2.98	2.98	
Frequency range: 800		to 1000	MHz
Permittivity range: 52.3		to 57.8	Calibrated for: 900 MHz
Conductivity range: 0.92		to 1.1 S/m	Calibrated for: 55
			1.05 S/m

The measurement within the required frequency interval satisfy an expanded probe calibration uncertainty ( $k=2$ )  $\leq 15\%$  for all measurement conditions. Please refer to SAR report for probe and dipole calibration certificates produce by the system manufacturer.



## Sensitivity in Tissue Simulating Liquid (Conversion Factors)

Please see Page 8.

## Boundary Effect

TSL                    900 MHz            Typical SAR gradient: 5 % per mm

Sensor Center to Phantom Surface Distance	3.7 mm	4.7 mm
SAR <sub>be</sub> [%]      Without Correction Algorithm	11.3	7.5
SAR <sub>be</sub> [%]      With Correction Algorithm	0.8	0.5

TSL                    1750 MHz            Typical SAR gradient: 10 % per mm

Sensor Center to Phantom Surface Distance	3.7 mm	4.7 mm
SAR <sub>be</sub> [%]      Without Correction Algorithm	10.1	6.5
SAR <sub>be</sub> [%]      With Correction Algorithm	0.8	0.6

## Sensor Offset

Probe Tip to Sensor Center                    **2.7** mm

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

<sup>a</sup> The uncertainties of NormX,Y,Z do not affect the E<sup>2</sup>-field uncertainty inside TSL (see Page 8).

<sup>b</sup> Numerical linearization parameter: uncertainty not required.