SAR PROBE CALIBRATION_JYCC790

The following procedures are recommended for DUT measurements at 150 MHz to 3 GHz to minimize probe calibration and tissue dielectric parameter discrepancies.

a) In general, DUT SAR measurements below 300 MHz should be within +/- 50 MHz of the probe calibration frequency.
SEE ALSO ITEM c).

b) At 300 MHz to 3 GHz, DUT measurements should be within +/- 100 MHz of the probe calibration frequency.
SEE ALSO ITEM c).

c) Measurements exceeding 50 % of these intervals, I.E.,
+/- 25 MHz, DUT f < 300 MHz, OR
+/- 50 MHz, DUT f >/= 300 MHz,
SHALL APPLY THE FOLLOWING additional steps:

1) When the actual tissue dielectric parameters used for probe calibration are available (careful about some probe manuf. list only nominal or range on calib. cert.), the differences for relative permittivity and conductivity between probe calibration and routine measurements should each be less than or equal to 5 % while also satisfying the required +/- 5 % tolerances in target dielectric parameters.

HCT>

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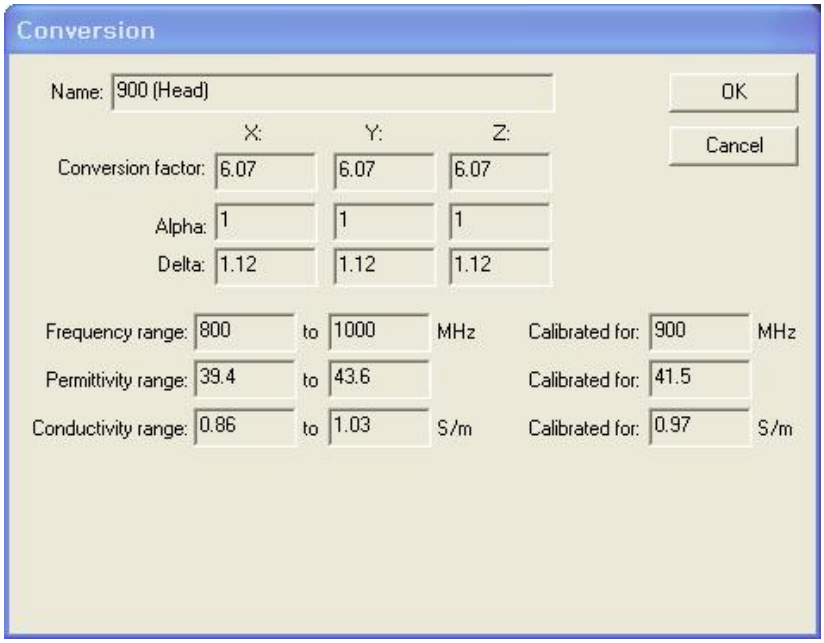
The test frequencies are properly matched as this is a cellular band. The probe calibration for permittivity and conductivity is within +/-5%, were the probe calibrated centre frequency at 900MHz has permittivity and conductivity of 41.5 and 0.97 respectively. At the probe extreme frequencies the following are true: at 800 MHz the permittivity and conductivity are 39.4 and 0.86 respectively. At 1000 MHz the permittivity and conductivity are 43.6 and 1.03 respectively. The probe was calibrated at these parameters in order to cover the frequency range 800 MHz to 1000 MHz.



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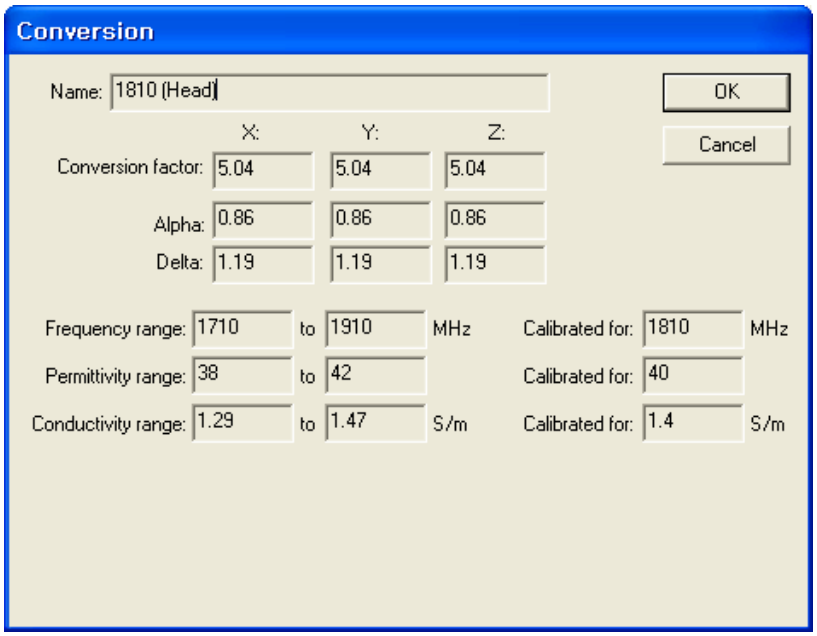
The test frequencies are properly matched as this is a cellular band. The probe calibration for permittivity and conductivity is within +/-5%, were the probe calibrated centre frequency at 1810MHz has permittivity and conductivity of 40.0 and 1.4 respectively. At the probe extreme frequencies the following are true: at 1710 MHz the permittivity and conductivity are 38 and 1.29 respectively. At 1910 MHz the permittivity and conductivity are 42 and 1.47 respectively. The probe was calibrated at these parameters in order to cover the frequency range 1710 MHz to 1910 MHz.



The target permittivity and conductivity at 835 MHz is 41.5 and 0.90 respectively which is within the calibrated range of the probe parameter. The following parameters are declared in the probe calibration certificate on page 8:

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f [MHz]	Validity [MHz][C]	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
900	± 50 / ± 100	Head	41.5 ± 5%	0.97 ± 5%	1.00	1.12	6.07 ± 11.0% (k=2)
1810	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.86	1.19	5.04 ± 11.0% (k=2)
1950	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.76	1.26	4.77 ± 11.0% (k=2)
2450	± 50 / ± 100	Head	39.2 ± 5%	1.80 ± 5%	0.70	1.32	4.47 ± 11.0% (k=2)
835	± 50 / ± 100	Body	55.2 ± 5%	0.97 ± 5%	1.00	1.17	5.63 ± 11.0% (k=2)
1810	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.81	1.22	5.07 ± 11.0% (k=2)
1900	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.74	1.31	4.68 ± 11.0% (k=2)
2300	± 50 / ± 100	Body	52.8 ± 5%	1.85 ± 5%	0.56	1.65	4.32 ± 11.0% (k=2)
2450	± 50 / ± 100	Body	52.7 ± 5%	1.95 ± 5%	0.60	1.52	4.15 ± 11.0% (k=2)
2600	± 50 / ± 100	Body	52.5 ± 5%	2.16 ± 5%	0.61	1.50	3.97 ± 11.0% (k=2)

[C] 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.

2) When nominal tissue dielectric parameters are PROVIDED in the probe calibration data, the tissue dielectric parameters measured for routine measurements should be less than the target relative permittivity and higher than the target conductivity values, to minimize SAR underestimations. Otherwise, a thorough analysis of the effective frequency interval supported by the probe calibration and dielectric medium should be included in the SAR report to substantiate the test results - SEE ITEM d). Alternatively, the measured 1-g SAR may be compensated with respect to +5 % tolerances in relative permittivity and -5 % tolerances in conductivity, computed according to valid SAR sensitivity data, to reduce SAR underestimation and maintain conservativeness.

d) When thorough analysis is required for the additional steps, the following SHALL ALSO BE ADDRESSED.
These other items can contribute to additional SAR differences, especially when the probe calibration, tissue dielectric parameters and device test frequencies are misaligned.

1) The probe conversion factor and its frequency response, with respect to the tissue dielectric media used during probe calibration and routine measurements, should be examined to determine if the effective frequency interval is adequate for the intended measurements to satisfy protocol requirements.

2) Measurements within the required frequency interval should satisfy an expanded probe calibration uncertainty (k=2) less than or equal to 15 % for all measurement conditions.

3) When SAR is reported within 10 % of the SAR limit, differences in field conditions and effects of output power levels on signal modulation between probe calibration and routine measurements should be examined to determine probe calibration validity.

4) Probe isotropy should also be assessed by rotating the probe in 15 degree increments at the peak SAR location of the zoom scan and accounted for in the measurement uncertainty.

HCT> As you can see we used the conductivity and permittivity parameters which are within +/- 5 % of the target values.
The measured SAR values in the report are all below 10% of the SAR limit.
The measurement within the required frequency interval satisfy an expanded probe calibration uncertainty (k=2) <= 15% for all measurement conditions. Please refer to SAR report for probe and dipole calibration certificates produce by the system manufacturer.

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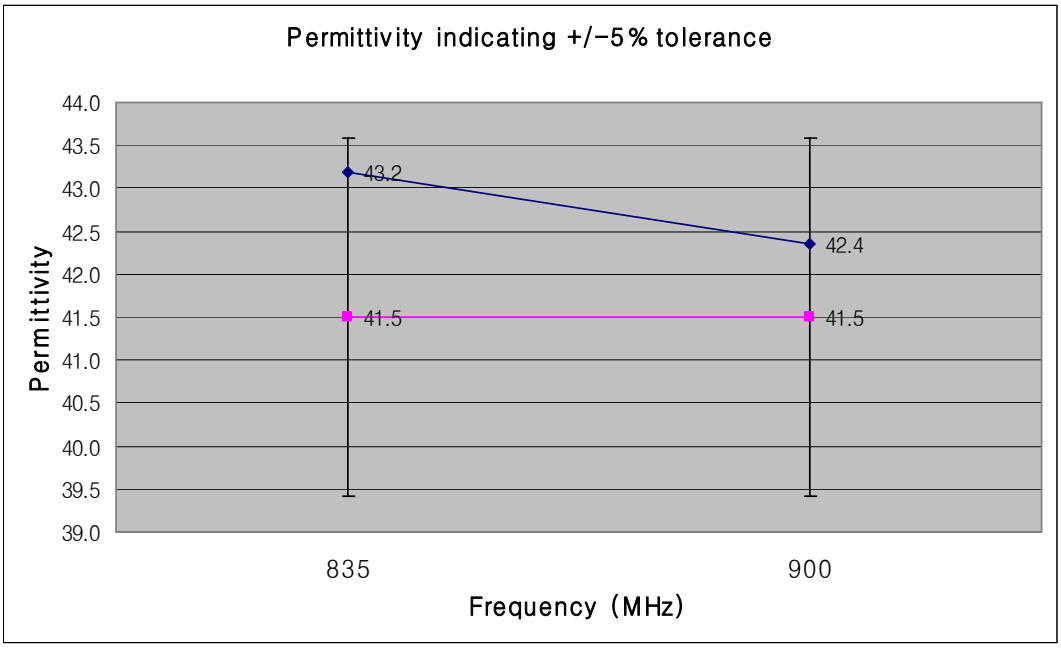
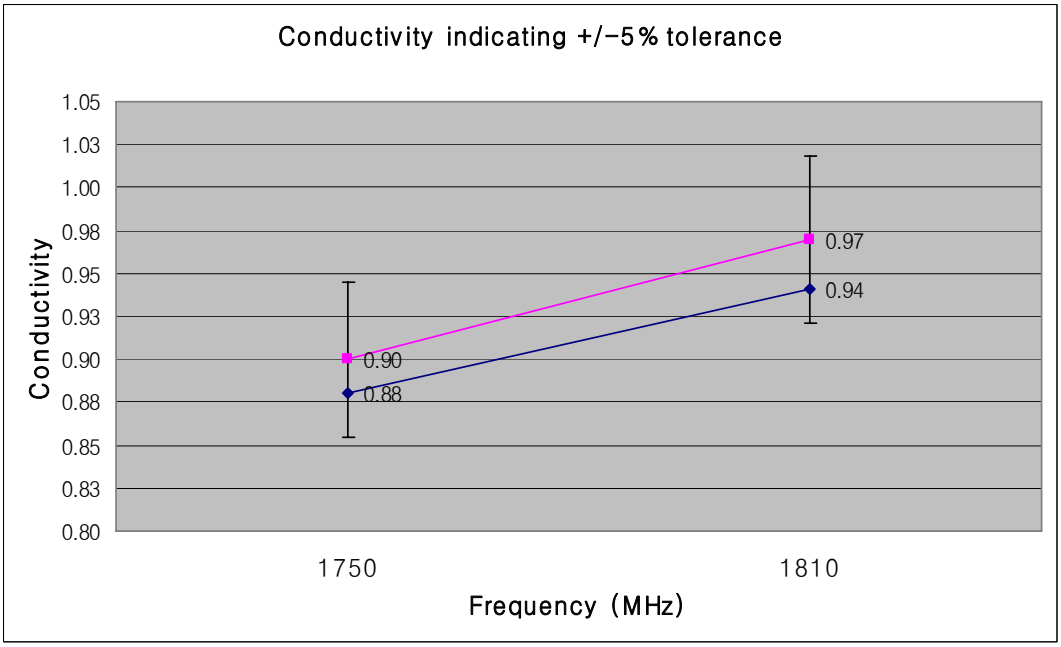
	Measured value		Target value	
Freq.(MHz)	ε	σ	ε	σ
835	43.2	0.88	41.5	0.9
900	42.4	0.941	41.5	0.97





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	Measured value		Target value	
Freq.(MHz)	ε	σ	ε	σ
1850	40.4	1.29	40.0	1.40
1900	40.2	1.36	40.0	1.40