Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

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Accreditation No.: **SCS 108**

Client **Sporton (Auden)**

Certificate No: **ET3-1787_Aug08**

CALIBRATION CERTIFICATE

Object	ET3DV6 - SN:1787
Calibration procedure(s)	QA CAL-01.v6 and QA CAL-23.v3 Calibration procedure for dosimetric E-field probes
Calibration date:	August 26, 2008
Condition of the calibrated item	In Tolerance

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	1-Apr-08 (No. 217-00788)	Apr-09
Power sensor E4412A	MY41495277	1-Apr-08 (No. 217-00788)	Apr-09
Power sensor E4412A	MY41498087	1-Apr-08 (No. 217-00788)	Apr-09
Reference 3 dB Attenuator	SN: S5054 (3c)	1-Jul-08 (No. 217-00865)	Jul-09
Reference 20 dB Attenuator	SN: S5086 (20b)	31-Mar-08 (No. 217-00787)	Apr-09
Reference 30 dB Attenuator	SN: S5129 (30b)	1-Jul-08 (No. 217-00866)	Jul-09
Reference Probe ES3DV2	SN: 3013	2-Jan-08 (No. ES3-3013_Jan08)	Jan-09
DAE4	SN: 660	3-Sep-07 (No. DAE4-660_Sep07)	Sep-08

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Oct-07)	In house check: Oct-09
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-07)	In house check: Oct-08

	Name	Function	Signature
Calibrated by:	Katja Pokovic	Technical Manager	
Approved by:	Niels Kuster	Quality Manager	

Issued: August 26, 2008

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Accreditation No.: SCS 108

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Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., ϑ = 0 is normal to probe axis

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization ϑ = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not effect the E^2-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,y,z * frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep (no uncertainty required). DCP does not depend on frequency nor media.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for f ≤ 800 MHz) and inside waveguide using analytical field distributions based on power measurements for f > 800 MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to *NORMx,y,z * ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- *Spherical isotropy (3D deviation from isotropy)*: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset*: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.

Probe ET3DV6

SN:1787

Manufactured:	May 28, 2003
Last calibrated:	August 28, 2007
Recalibrated:	August 26, 2008

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

ET3DV6 SN:1787 August 26, 2008

DASY - Parameters of Probe: ET3DV6 SN:1787

Sensitivity in Free Space[A] Diode Compression[B]

NormX	1.63 ± 10.1%	$\mu V/(V/m)^2$	DCP X	90 mV
NormY	1.67 ± 10.1%	$\mu V/(V/m)^2$	DCP Y	93 mV
NormZ	2.18 ± 10.1%	$\mu V/(V/m)^2$	DCP Z	92 mV

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_{be} [%]	Without Correction Algorithm	11.3	7.5
SAR_{be} [%]	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_{be} [%]	Without Correction Algorithm	10.1	6.5
SAR_{be} [%]	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%.

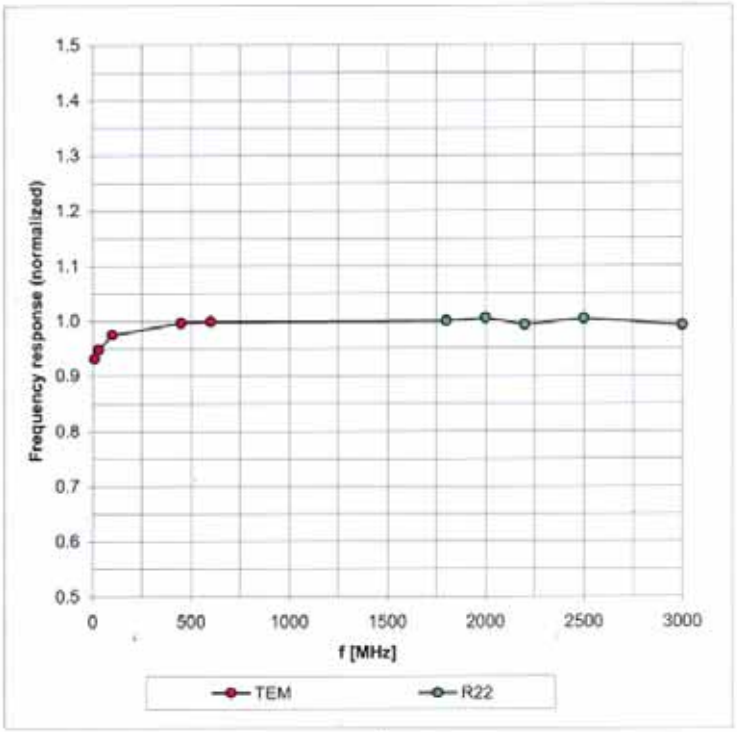
[A] The uncertainties of NormX,Y,Z do not affect the E^2-field uncertainty inside TSL (see Page 8).

[B] Numerical linearization parameter: uncertainty not required.

ET3DV6 SN:1787 August 26, 2008

Frequency Response of E-Field

(TEM-Cell:ifi110 EXX, Waveguide: R22)

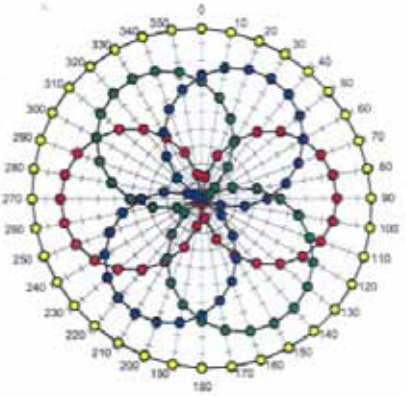


Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

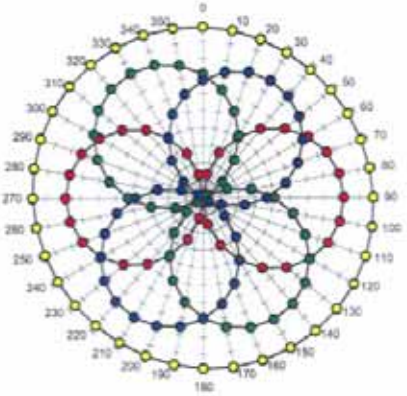
ET3DV6 SN:1787 August 26, 2008

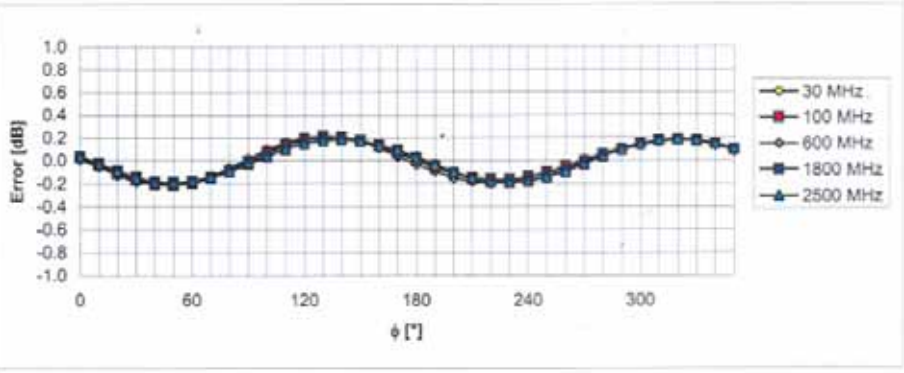
Receiving Pattern (ϕ), ϑ = 0°

f = 600 MHz, TEM ifi110EXX



f = 1800 MHz, WG R22



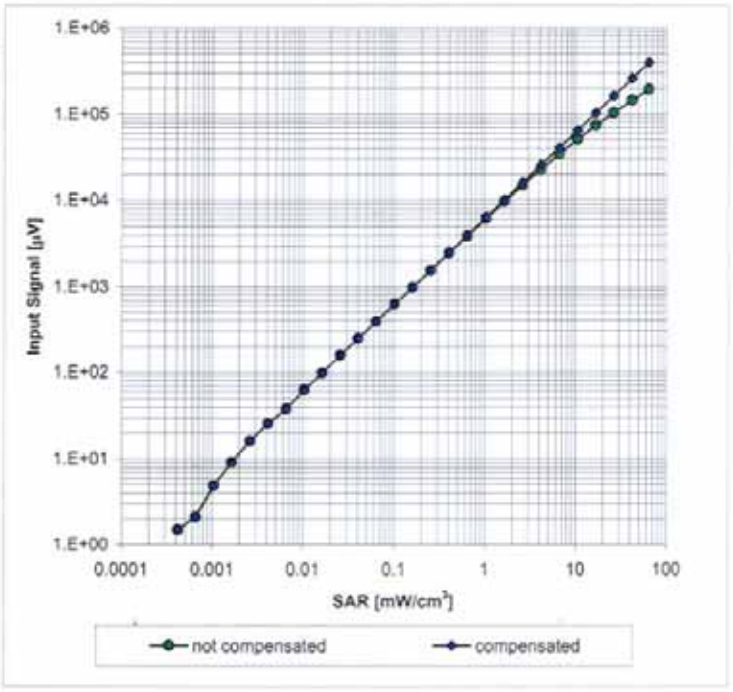


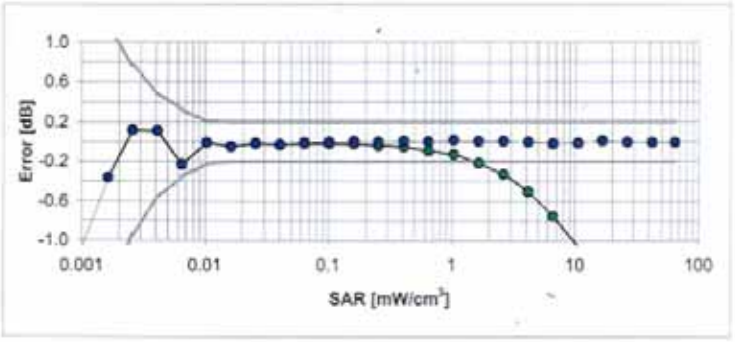
Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

ET3DV6 SN:1787 August 26, 2008

Dynamic Range f(SAR_{head})

(Waveguide R22, f = 1800 MHz)

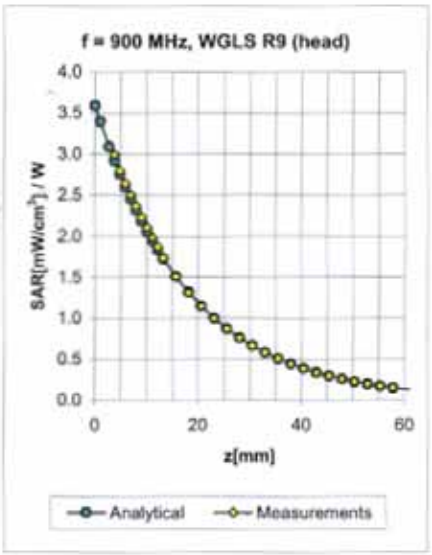


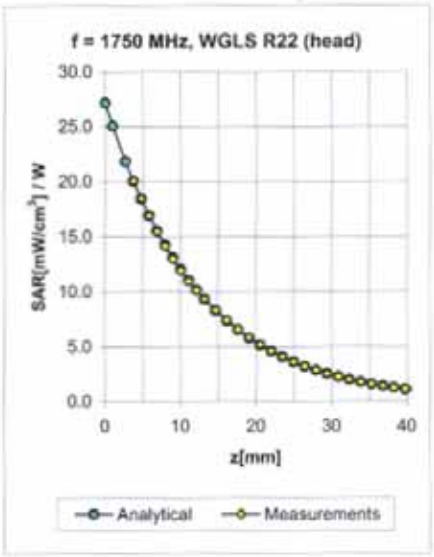


Uncertainty of Linearity Assessment: ± 0.6% (k=2)

ET3DV6 SN:1787 August 26, 2008

Conversion Factor Assessment





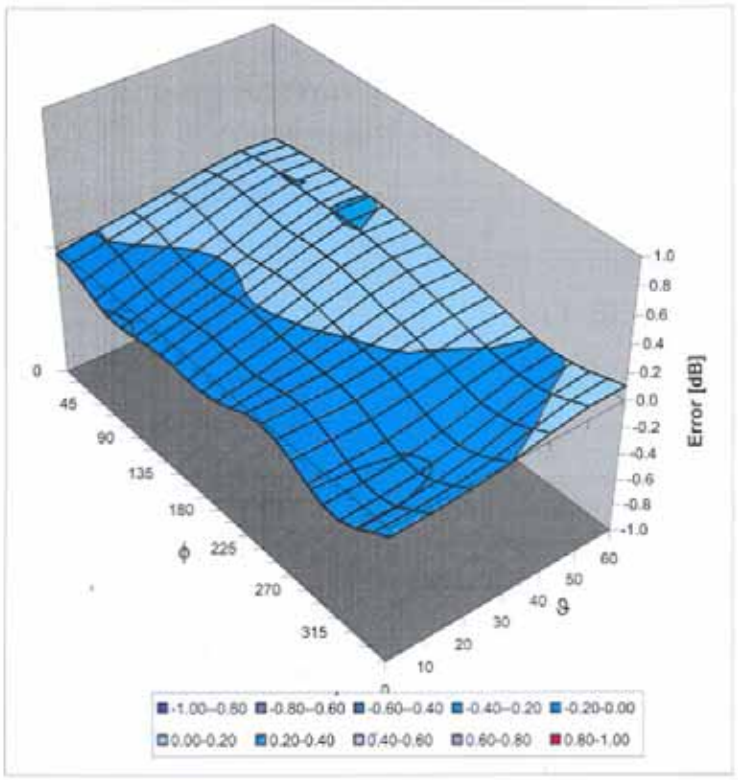
f [MHz]	Validity [MHz][C]	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
900	± 50 / ± 100	Head	41.5 ± 5%	0.97 ± 5%	0.30	2.80	6.06 ± 11.0% (k=2)
1750	± 50 / ± 100	Head	40.1 ± 5%	1.37 ± 5%	0.53	2.11	5.36 ± 11.0% (k=2)
1950	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.59	1.96	5.01 ± 11.0% (k=2)
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)

[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.

ET3DV6 SN:1787 August 26, 2008

Deviation from Isotropy in HSL

Error (ϕ, ϑ), f = 900 MHz



Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

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Accreditation No.: SCS 108

Client Sporton (Auden)

Certificate No: ET3-1787_May09

CALIBRATION CERTIFICATE

Object	ET3DV6 - SN:1787
Calibration procedure(s)	QA CAL-01.v6 and QA CAL-23.v3 Calibration procedure for dosimetric E-field probes
Calibration date:	May 26, 2009
Condition of the calibrated item	In Tolerance

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	1-Apr-09 (No. 217-01030)	Apr-10
Power sensor E4412A	MY41495277	1-Apr-09 (No. 217-01030)	Apr-10
Power sensor E4412A	MY41498087	1-Apr-09 (No. 217-01030)	Apr-10
Reference 3 dB Attenuator	SN: S5054 (3c)	31-Mar-09 (No. 217-01026)	Mar-10
Reference 20 dB Attenuator	SN: S5086 (20b)	31-Mar-09 (No. 217-01028)	Mar-10
Reference 30 dB Attenuator	SN: S5129 (30b)	31-Mar-09 (No. 217-01027)	Mar-10
Reference Probe ES3DV2	SN: 3013	2-Jan-09 (No. ES3-3013_Jan09)	Jan-10
DAE4	SN: 660	9-Sep-08 (No. DAE4-660_Sep08)	Sep-09

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Oct-07)	In house check: Oct-09
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-08)	In house check: Oct-09

	Name	Function	Signature
Calibrated by:	Marcel Fehr	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: May 27, 2009

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Glossary:

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ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., ϑ = 0 is normal to probe axis

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization ϑ = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not effect the E^2-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,y,z * frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep (no uncertainty required). DCP does not depend on frequency nor media.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for f ≤ 800 MHz) and inside waveguide using analytical field distributions based on power measurements for f > 800 MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to *NORMx,y,z * ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- *Spherical isotropy (3D deviation from isotropy)*: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset*: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.

ET3DV6 SN:1787 May 26, 2009

Probe ET3DV6

SN:1787

Manufactured:	May 28, 2003
Last calibrated:	August 26, 2008
Modified:	May 20, 2009
Recalibrated:	May 26, 2009

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

ET3DV6 SN:1787 May 26, 2009

DASY - Parameters of Probe: ET3DV6 SN:1787

Sensitivity in Free Space[A]

NormX	**1.63** ± 10.1%	$\mu V/(V/m)^2$	DCP X	**95** mV
NormY	**1.72** ± 10.1%	$\mu V/(V/m)^2$	DCP Y	**94** mV
NormZ	**2.14** ± 10.1%	$\mu V/(V/m)^2$	DCP Z	**94** mV

Sensitivity in Tissue Simulating Liquid (Conversion Factors)

Please see Page 8.

Boundary Effect

TSL **835 MHz** **Typical SAR gradient: 5 % per mm**

Sensor Center to Phantom Surface Distance		**3.7 mm**	**4.7 mm**
SAR_{be} [%]	Without Correction Algorithm	10.0	5.9
SAR_{be} [%]	With Correction Algorithm	0.9	0.6

TSL **1750 MHz** **Typical SAR gradient: 10 % per mm**

Sensor Center to Phantom Surface Distance		**3.7 mm**	**4.7 mm**
SAR_{be} [%]	Without Correction Algorithm	12.3	8.4
SAR_{be} [%]	With Correction Algorithm	0.9	0.7

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%.

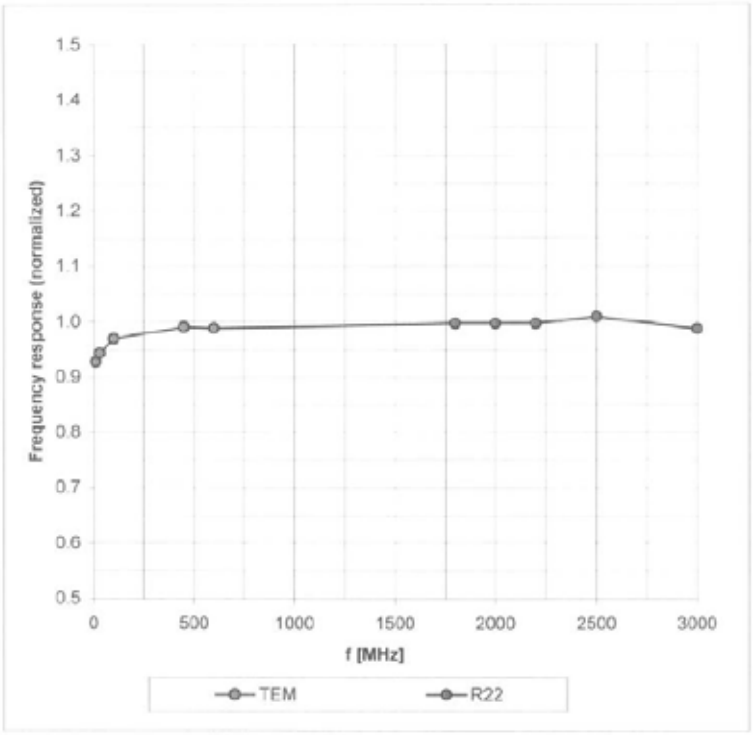
[A] The uncertainties of NormX,Y,Z do not affect the E^2-field uncertainty inside TSL (see Page 8).

[B] Numerical linearization parameter: uncertainty not required.

ET3DV6 SN:1787 May 26, 2009

Frequency Response of E-Field

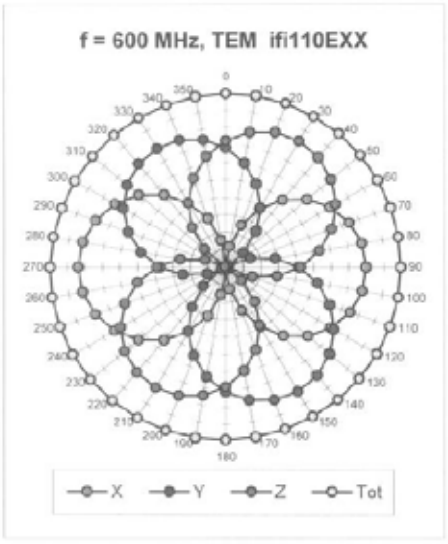
(TEM-Cell:ifi110 EXX, Waveguide: R22)

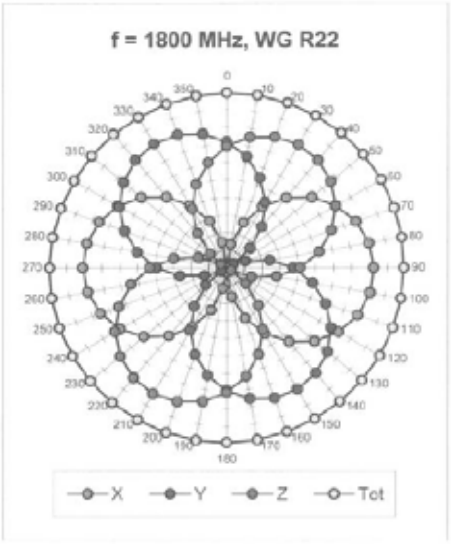


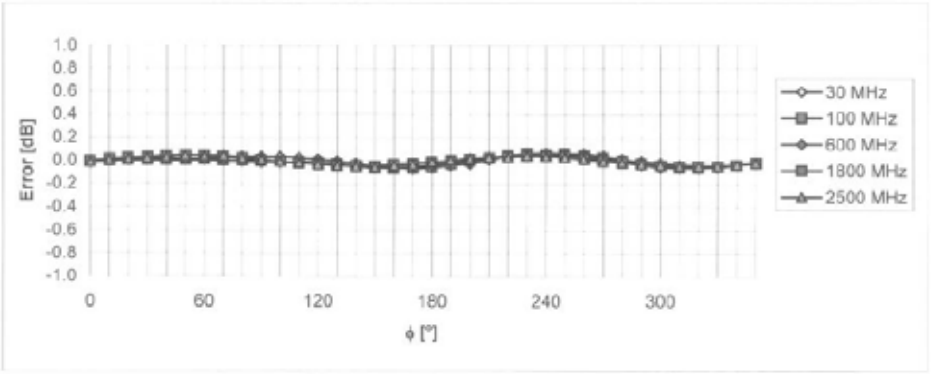
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

ET3DV6 SN:1787 May 26, 2009

Receiving Pattern (ϕ), ϑ = 0°





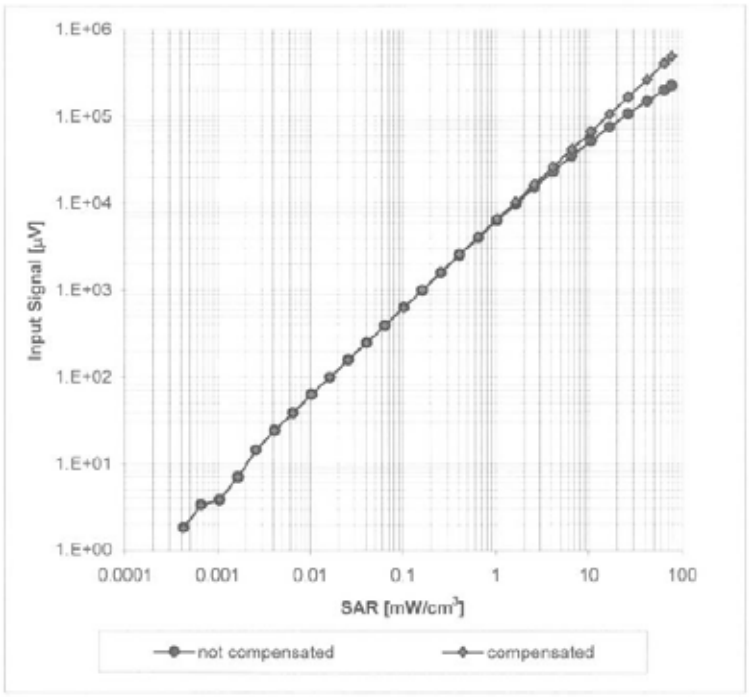


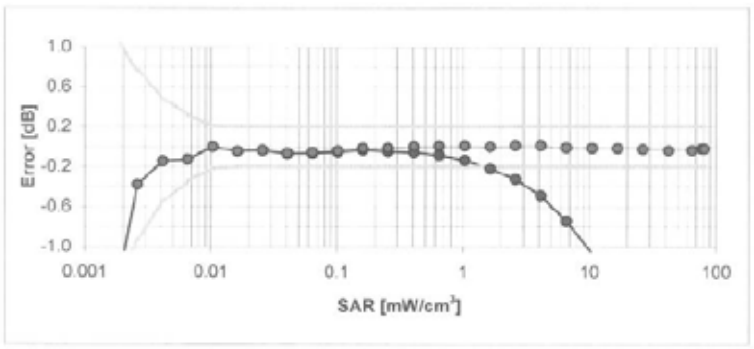
Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

ET3DV6 SN:1787 May 26, 2009

Dynamic Range f(SAR_{head})

(Waveguide R22, f = 1800 MHz)

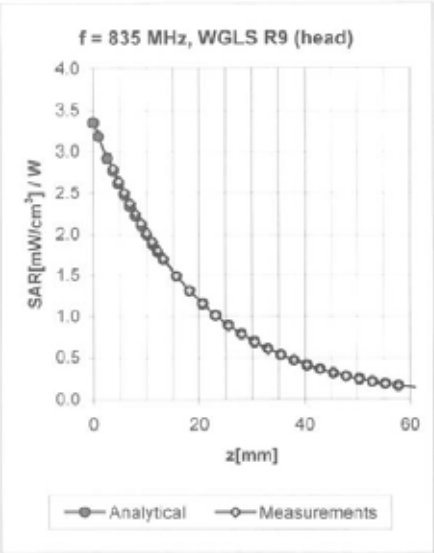


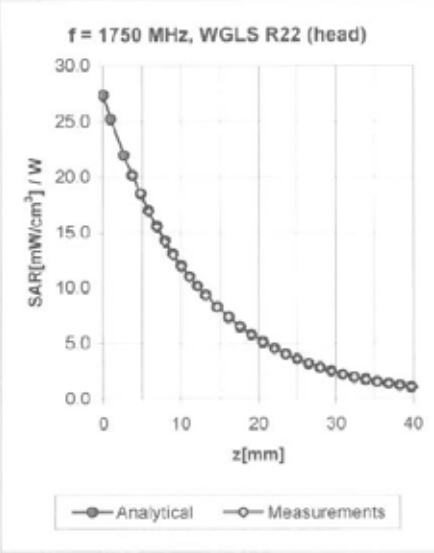


Uncertainty of Linearity Assessment: ± 0.6% (k=2)

ET3DV6 SN:1787 May 26, 2009

Conversion Factor Assessment





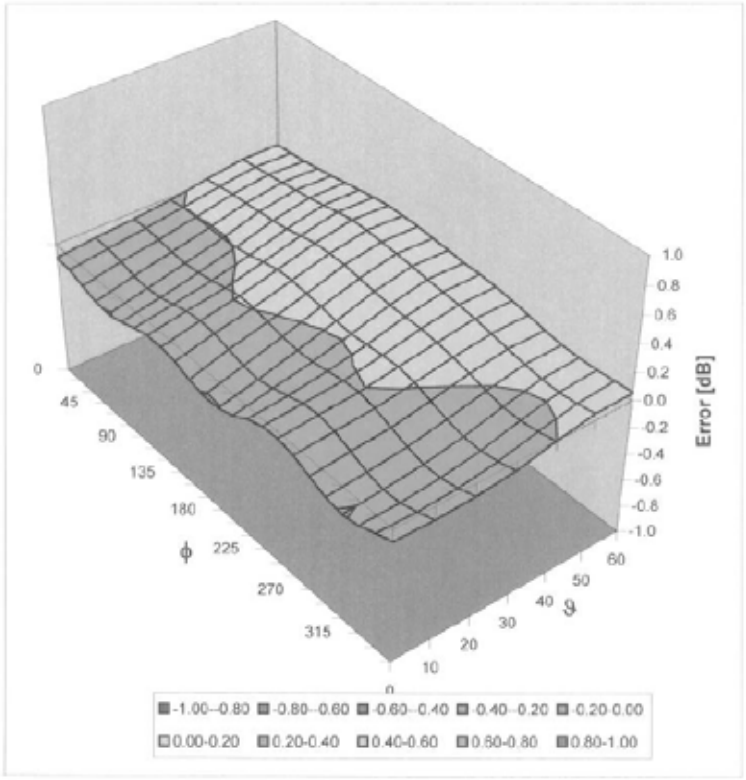
f [MHz]	Validity [MHz][C]	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
835	± 50 / ± 100	Head	41.5 ± 5%	0.90 ± 5%	0.52	2.01	6.26 ± 11.0% (k=2)
1750	± 50 / ± 100	Head	40.1 ± 5%	1.37 ± 5%	0.49	2.72	5.34 ± 11.0% (k=2)
1900	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.58	2.44	5.12 ± 11.0% (k=2)
2450	± 50 / ± 100	Head	39.2 ± 5%	1.80 ± 5%	0.99	1.69	4.51 ± 11.0% (k=2)
835	± 50 / ± 100	Body	55.2 ± 5%	0.97 ± 5%	0.39	2.37	6.09 ± 11.0% (k=2)
1750	± 50 / ± 100	Body	53.4 ± 5%	1.49 ± 5%	0.63	3.27	4.82 ± 11.0% (k=2)
1900	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.90	2.43	4.49 ± 11.0% (k=2)
2450	± 50 / ± 100	Body	52.7 ± 5%	1.95 ± 5%	0.80	1.50	3.96 ± 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.

ET3DV6 SN:1787 May 26, 2009

Deviation from Isotropy in HSL

Error (ϕ, ϑ), f = 900 MHz



Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

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Accreditation No.: **SCS 108**

Client **Sporton (Auden)**

Certificate No: **EX3-3514_Jan09**

CALIBRATION CERTIFICATE

Object	EX3DV3 - SN:3514
Calibration procedure(s)	QA CAL-01.v6, QA CAL-14.v3 and QA CAL-23.v3 Calibration procedure for dosimetric E-field probes
Calibration date:	January 21, 2009
Condition of the calibrated item	In Tolerance

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	1-Apr-08 (No. 217-00788)	Apr-09
Power sensor E4412A	MY41495277	1-Apr-08 (No. 217-00788)	Apr-09
Power sensor E4412A	MY41498087	1-Apr-08 (No. 217-00788)	Apr-09
Reference 3 dB Attenuator	SN: S5054 (3c)	1-Jul-08 (No. 217-00865)	Jul-09
Reference 20 dB Attenuator	SN: S5086 (20b)	31-Mar-08 (No. 217-00787)	Apr-09
Reference 30 dB Attenuator	SN: S5129 (30b)	1-Jul-08 (No. 217-00866)	Jul-09
Reference Probe ES3DV2	SN: 3013	2-Jan-09 (No. ES3-3013_Jan09)	Jan-10
DAE4	SN: 660	9-Sep-08 (No. DAE4-660_Sep08)	Sep-09

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Oct-07)	In house check: Oct-09
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-08)	In house check: Oct-09

	Name	Function	Signature
Calibrated by:	Katja Pokovic	Technical Manager	
Approved by:	Niels Kuster	Quality Manager	

Issued: January 21, 2009

Calibration Laboratory of
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Zeughausstrasse 43, 8004 Zurich, Switzerland

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The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 108

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., ϑ = 0 is normal to probe axis

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization ϑ = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not effect the E^2-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,y,z * frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep (no uncertainty required). DCP does not depend on frequency nor media.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for f ≤ 800 MHz) and inside waveguide using analytical field distributions based on power measurements for f > 800 MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to *NORMx,y,z * ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- *Spherical isotropy (3D deviation from isotropy)*: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset*: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.

Probe EX3DV3

SN:3514

Manufactured:	December 15, 2002
Last calibrated:	January 31, 2008
Recalibrated:	January 21, 2009

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

EX3DV3 SN:3514 January 21, 2009

DASY - Parameters of Probe: EX3DV3 SN:3514

Sensitivity in Free Space[A] Diode Compression[B]

NormX	**0.66** ± 10.1%	$\mu V/(V/m)^2$	DCP X	**91** mV
NormY	**0.70** ± 10.1%	$\mu V/(V/m)^2$	DCP Y	**94** mV
NormZ	**0.60** ± 10.1%	$\mu V/(V/m)^2$	DCP Z	**95** mV

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		**2.0 mm**	**3.0 mm**
SAR_{be} [%]	Without Correction Algorithm	7.7	4.4
SAR_{be} [%]	With Correction Algorithm	0.8	0.3

TSL **1810 MHz** **Typical SAR gradient: 10 % per mm**

Sensor Center to Phantom Surface Distance		**2.0 mm**	**3.0 mm**
SAR_{be} [%]	Without Correction Algorithm	6.2	3.4
SAR_{be} [%]	With Correction Algorithm	0.7	0.3

Sensor Offset

Probe Tip to Sensor Center	**1.0** 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%.

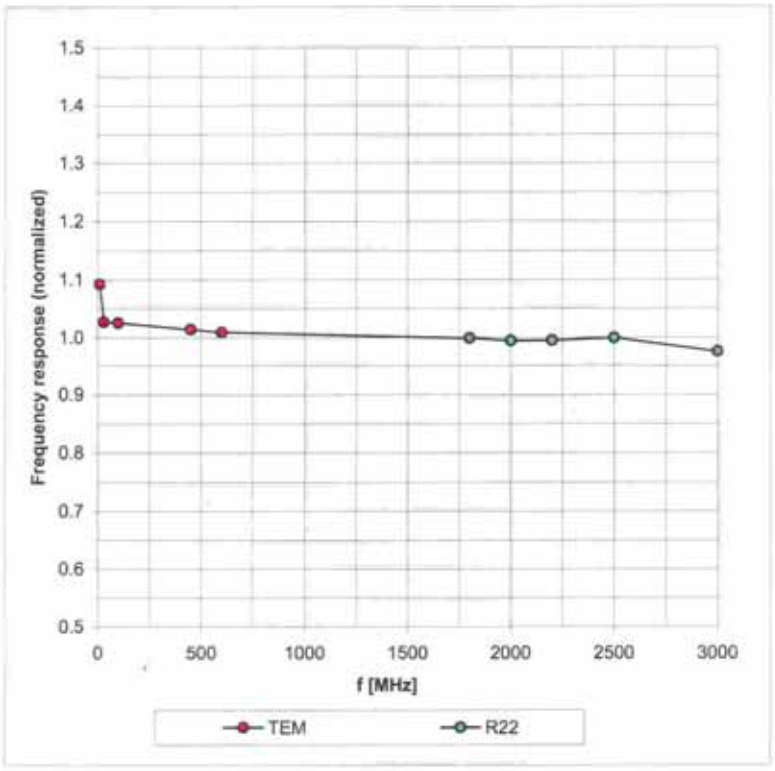
[A] The uncertainties of NormX,Y,Z do not affect the E^2-field uncertainty inside TSL (see Page 8).

[B] Numerical linearization parameter: uncertainty not required.

EX3DV3 SN:3514 January 21, 2009

Frequency Response of E-Field

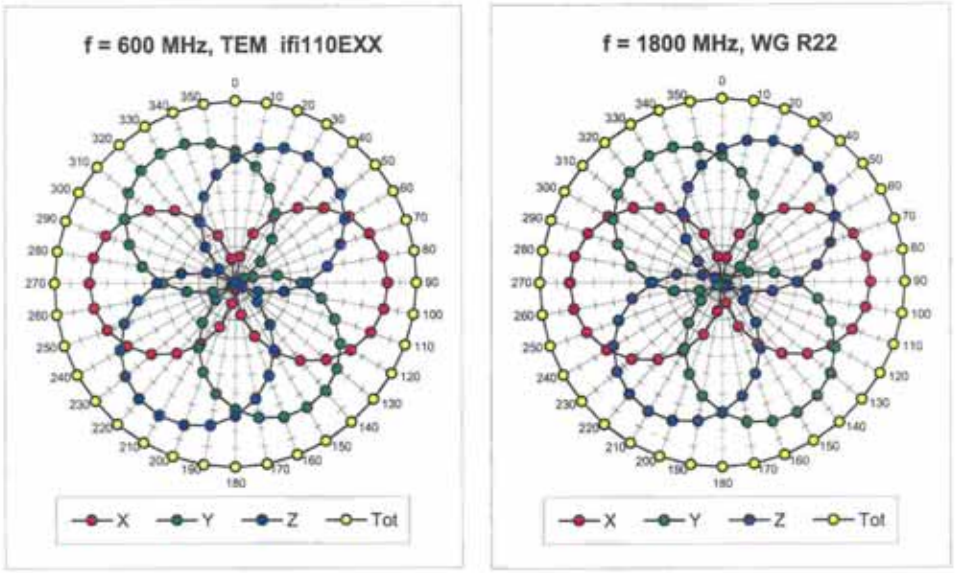
(TEM-Cell:ifi110 EXX, Waveguide: R22)

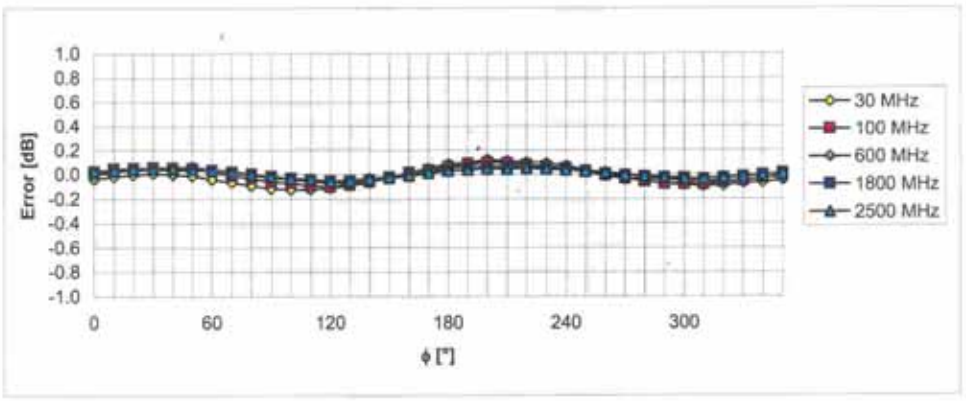


Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

EX3DV3 SN:3514 January 21, 2009

Receiving Pattern (ϕ), ϑ = 0°



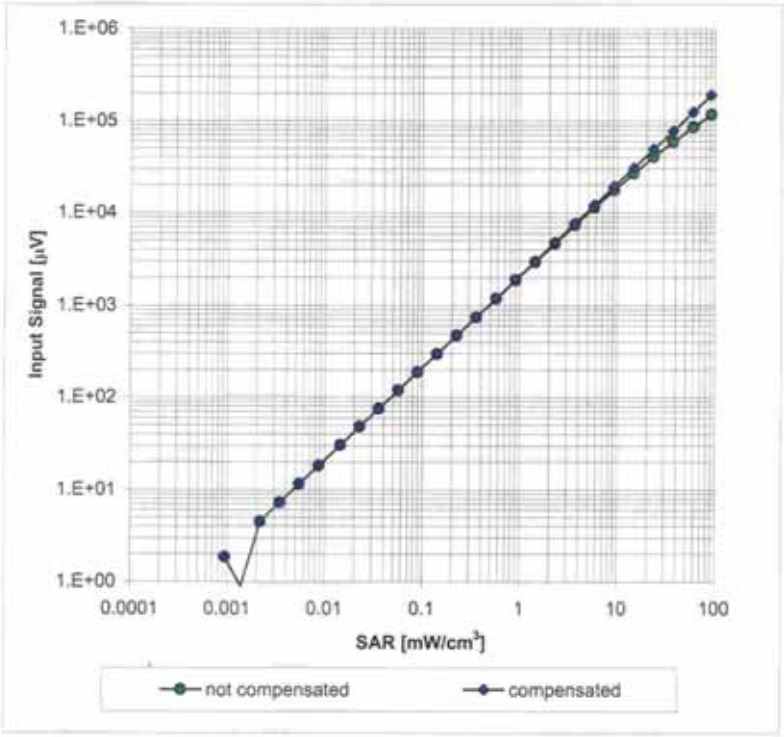


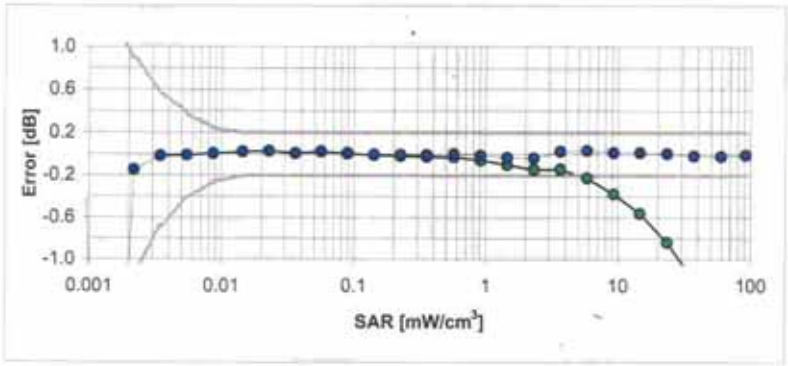
Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

EX3DV3 SN:3514 January 21, 2009

Dynamic Range f(SAR_{head})

(Waveguide R22, f = 1800 MHz)





Uncertainty of Linearity Assessment: ± 0.6% (k=2)

EX3DV3 SN:3514 January 21, 2009

Conversion Factor Assessment

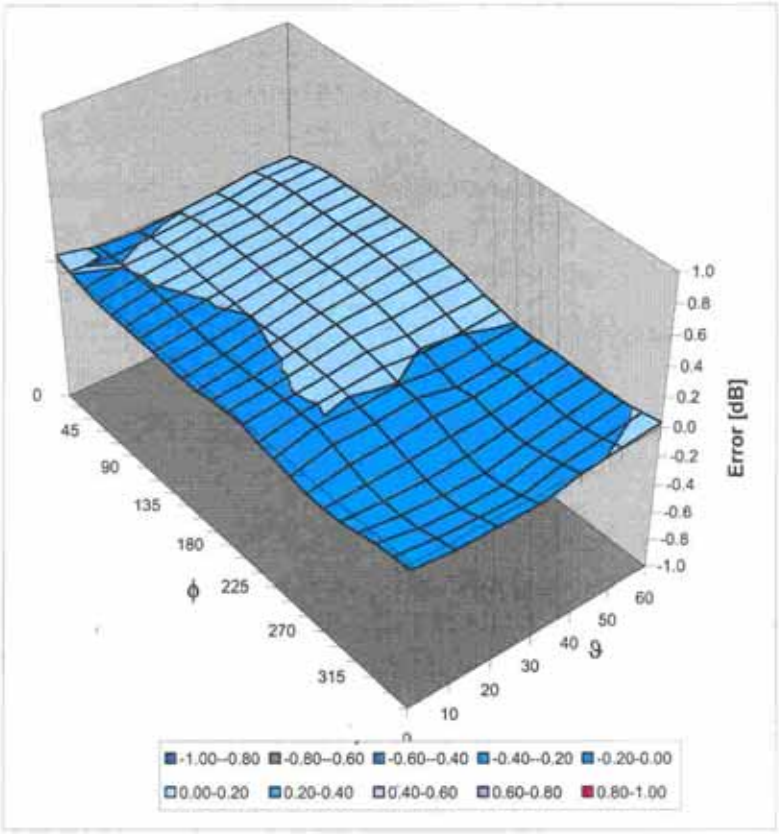
f [MHz]	Validity [MHz][C]	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
900	± 50 / ± 100	Head	41.5 ± 5%	0.97 ± 5%	0.45	0.76	9.31 ± 11.0% (k=2)
1810	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.60	0.63	8.16 ± 11.0% (k=2)
2300	± 50 / ± 100	Head	39.4 ± 5%	1.71 ± 5%	0.53	0.63	7.78 ± 11.0% (k=2)
2600	± 50 / ± 100	Head	39.0 ± 5%	1.96 ± 5%	0.16	2.19	7.34 ± 11.0% (k=2)
3500	± 50 / ± 100	Head	37.9 ± 5%	2.91 ± 5%	0.50	0.86	6.89 ± 13.1% (k=2)
5200	± 50 / ± 100	Head	36.0 ± 5%	4.66 ± 5%	0.40	1.70	4.78 ± 13.1% (k=2)
5300	± 50 / ± 100	Head	35.9 ± 5%	4.76 ± 5%	0.40	1.70	4.40 ± 13.1% (k=2)
5500	± 50 / ± 100	Head	35.6 ± 5%	4.96 ± 5%	0.40	1.70	4.22 ± 13.1% (k=2)
5600	± 50 / ± 100	Head	35.5 ± 5%	5.07 ± 5%	0.40	1.70	4.13 ± 13.1% (k=2)
5800	± 50 / ± 100	Head	35.3 ± 5%	5.27 ± 5%	0.40	1.70	4.13 ± 13.1% (k=2)
900	± 50 / ± 100	Body	55.0 ± 5%	1.05 ± 5%	0.42	0.76	9.41 ± 11.0% (k=2)
1810	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.85	0.56	8.18 ± 11.0% (k=2)
2300	± 50 / ± 100	Body	52.8 ± 5%	1.85 ± 5%	0.18	4.17	7.60 ± 11.0% (k=2)
2600	± 50 / ± 100	Body	52.5 ± 5%	2.16 ± 5%	0.34	1.14	7.20 ± 11.0% (k=2)
3500	± 50 / ± 100	Body	51.3 ± 5%	3.31 ± 5%	0.53	0.81	6.40 ± 13.1% (k=2)
5200	± 50 / ± 100	Body	49.0 ± 5%	5.30 ± 5%	0.45	1.75	4.29 ± 13.1% (k=2)
5300	± 50 / ± 100	Body	48.9 ± 5%	5.42 ± 5%	0.45	1.75	3.94 ± 13.1% (k=2)
5500	± 50 / ± 100	Body	48.6 ± 5%	5.65 ± 5%	0.45	1.75	3.88 ± 13.1% (k=2)
5600	± 50 / ± 100	Body	48.5 ± 5%	5.77 ± 5%	0.45	1.75	3.89 ± 13.1% (k=2)
5800	± 50 / ± 100	Body	48.2 ± 5%	6.00 ± 5%	0.45	1.75	3.85 ± 13.1% (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.

EX3DV3 SN:3514 January 21, 2009

Deviation from Isotropy in HSL

Error (ϕ, ϑ), f = 900 MHz



Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

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Accreditation No.: SCS 108

Client Sporton (Auden)

Certificate No: DAE3-577_Nov08

CALIBRATION CERTIFICATE

Object	DAE3 - SD 000 D03 AA - SN: 577
Calibration procedure(s)	QA CAL-06.v12 Calibration procedure for the data acquisition electronics (DAE)
Calibration date:	November 12, 2008
Condition of the calibrated item	In Tolerance

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Fluke Process Calibrator Type 702	SN: 6295803	30-Sep-08 (No: 7673)	Sep-09
Keithley Multimeter Type 2001	SN: 0810278	30-Sep-08 (No: 7670)	Sep-09
Secondary Standards	**ID #**	**Check Date (in house)**	**Scheduled Check**
Calibrator Box V1.1	SE UMS 006 AB 1004	06-Jun-08 (in house check)	In house check: Jun-09

	Name	Function	Signature
Calibrated by:	Andrea Guntli	Technician	
Approved by:	Fin Bomholt	R&D Director	i.V.

Issued: November 12, 2008

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Zeughausstrasse 43, 8004 Zurich, Switzerland

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Accreditation No.: SCS 108

Glossary

DAE	data acquisition electronics
Connector angle	information used in DASY system to align probe sensor X to the robot coordinate system.

Methods Applied and Interpretation of Parameters

- *DC Voltage Measurement:* Calibration Factor assessed for use in DASY system by comparison with a calibrated instrument traceable to national standards. The figure given corresponds to the full scale range of the voltmeter in the respective range.
- *Connector angle*: The angle of the connector is assessed measuring the angle mechanically by a tool inserted. Uncertainty is not required.
- The following parameters as documented in the Appendix contain technical information as a result from the performance test and require no uncertainty.
  - *DC Voltage Measurement Linearity:* Verification of the Linearity at +10% and -10% of the nominal calibration voltage. Influence of offset voltage is included in this measurement.
  - *Common mode sensitivity:* Influence of a positive or negative common mode voltage on the differential measurement.
  - *Channel separation:* Influence of a voltage on the neighbor channels not subject to an input voltage.
  - *AD Converter Values with inputs shorted:* Values on the internal AD converter corresponding to zero input voltage
  - *Input Offset Measurement*: Output voltage and statistical results over a large number of zero voltage measurements.
  - *Input Offset Current:* Typical value for information; Maximum channel input offset current, not considering the input resistance.
  - *Input resistance:* DAE input resistance at the connector, during internal auto-zeroing and during measurement.
  - *Low Battery Alarm Voltage:* Typical value for information. Below this voltage, a battery alarm signal is generated.
  - *Power consumption:* Typical value for information. Supply currents in various operating modes.

DC Voltage Measurement

A/D - Converter Resolution nominal

High Range:	1LSB =	6.1μV ,	full range =	-100...+300 mV
Low Range:	1LSB =	61nV ,	full range =	-1.....+3mV

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

Calibration Factors	X	Y	Z
High Range	404.437 ± 0.1% (k=2)	403.882 ± 0.1% (k=2)	404.321 ± 0.1% (k=2)
Low Range	3.93985 ± 0.7% (k=2)	3.94699 ± 0.7% (k=2)	3.94542 ± 0.7% (k=2)

Connector Angle

Connector Angle to be used in DASY system	268 ° ± 1 °

Appendix

1. DC Voltage Linearity

High Range		Input (μV)	Reading (μV)	Error (%)
Channel X	+ Input	200000	200000.5	0.00
Channel X	+ Input	20000	20006.28	0.03
Channel X	- Input	20000	-19997.96	-0.01
Channel Y	+ Input	200000	199999.8	0.00
Channel Y	+ Input	20000	20003.35	0.02
Channel Y	- Input	20000	-20003.31	0.02
Channel Z	+ Input	200000	200000.3	0.00
Channel Z	+ Input	20000	20006.28	0.03
Channel Z	- Input	20000	-19999.42	0.00

Low Range		Input (μV)	Reading (μV)	Error (%)
Channel X	+ Input	2000	2000	0.00
Channel X	+ Input	200	200.64	0.32
Channel X	- Input	200	-199.61	-0.19
Channel Y	+ Input	2000	2000	0.00
Channel Y	+ Input	200	199.39	-0.31
Channel Y	- Input	200	-201.03	0.52
Channel Z	+ Input	2000	2000	0.00
Channel Z	+ Input	200	199.42	-0.29
Channel Z	- Input	200	-200.73	0.36

2. Common mode sensitivity

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Common mode Input Voltage (mV)	High Range Average Reading (μV)	Low Range Average Reading (μV)
Channel X	200	13.38	13.83
	- 200	-13.53	-13.82
Channel Y	200	-5.55	-6.09
	- 200	5.06	5.66
Channel Z	200	-1.00	-0.72
	- 200	-0.80	-0.52

3. Channel separation

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Input Voltage (mV)	Channel X (μV)	Channel Y (μV)	Channel Z (μV)
Channel X	200	-	1.66	0.50
Channel Y	200	1.90	-	3.95
Channel Z	200	-0.95	0.48	-

4. AD-Converter Values with inputs shorted

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	High Range (LSB)	Low Range (LSB)
Channel X	15967	16080
Channel Y	15851	16385
Channel Z	16197	16100

5. Input Offset Measurement

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec
Input 10MΩ

	Average (μV)	min. Offset (μV)	max. Offset (μV)	Std. Deviation (μV)
Channel X	1.13	-1.22	2.29	0.58
Channel Y	-1.51	-2.99	0.83	0.52
Channel Z	0.02	-0.89	0.92	0.38

6. Input Offset Current

Nominal Input circuitry offset current on all channels: <25fA

7. Input Resistance

	Zeroing (MOhm)	Measuring (MOhm)
Channel X	0.2000	198.6
Channel Y	0.2001	199.4
Channel Z	0.2000	198.8

8. Low Battery Alarm Voltage (verified during pre test)

Typical values	Alarm Level (VDC)
Supply (+ Vcc)	+7.9
Supply (- Vcc)	-7.6

9. Power Consumption (verified during pre test)

Typical values	Switched off (mA)	Stand by (mA)	Transmitting (mA)
Supply (+ Vcc)	+0.0	+6	+14
Supply (- Vcc)	–0.01	-8	-9

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Accreditation No.: SCS 108

Client **Sporton (Auden)**

Certificate No: DAE4-778_Sep08

CALIBRATION CERTIFICATE

Object	DAE4 - SD 000 D04 BG - SN: 778
Calibration procedure(s)	QA CAL-06.v12 Calibration procedure for the data acquisition electronics (DAE)
Calibration date:	September 22, 2008
Condition of the calibrated item	In Tolerance

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Fluke Process Calibrator Type 702	SN: 6295803	04-Oct-07 (No: 6467)	Oct-08
Keithley Multimeter Type 2001	SN: 0810278	03-Oct-07 (No: 6465)	Oct-08
Secondary Standards	**ID #**	**Check Date (in house)**	**Scheduled Check**
Calibrator Box V1.1	SE UMS 006 AB 1004	06-Jun-08 (in house check)	In house check: Jun-09

	Name	Function	Signature
Calibrated by:	Andrea Guntli	Technician	
Approved by:	Fin Bomholt	R&D Director	

Issued: September 22, 2008

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Accreditation No.: SCS 108

Glossary

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Connector angle	information used in DASY system to align probe sensor X to the robot coordinate system.

Methods Applied and Interpretation of Parameters

- *DC Voltage Measurement:* Calibration Factor assessed for use in DASY system by comparison with a calibrated instrument traceable to national standards. The figure given corresponds to the full scale range of the voltmeter in the respective range.
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  - *DC Voltage Measurement Linearity:* Verification of the Linearity at +10% and -10% of the nominal calibration voltage. Influence of offset voltage is included in this measurement.
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  - *Channel separation:* Influence of a voltage on the neighbor channels not subject to an input voltage.
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  - *Input Offset Measurement*: Output voltage and statistical results over a large number of zero voltage measurements.
  - *Input Offset Current:* Typical value for information; Maximum channel input offset current, not considering the input resistance.
  - *Input resistance:* DAE input resistance at the connector, during internal auto-zeroing and during measurement.
  - *Low Battery Alarm Voltage:* Typical value for information. Below this voltage, a battery alarm signal is generated.
  - *Power consumption:* Typical value for information. Supply currents in various operating modes.

DC Voltage Measurement

A/D - Converter Resolution nominal

High Range:	1LSB =	6.1μV ,	full range =	-100...+300 mV
Low Range:	1LSB =	61nV ,	full range =	-1.....+3mV

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

Calibration Factors	X	Y	Z
High Range	404.686 ± 0.1% (k=2)	403.490 ± 0.1% (k=2)	405.045 ± 0.1% (k=2)
Low Range	3.99455 ± 0.7% (k=2)	3.96369 ± 0.7% (k=2)	3.99417 ± 0.7% (k=2)

Connector Angle

Connector Angle to be used in DASY system	309 ° ± 1 °

Appendix

1. DC Voltage Linearity

High Range		Input (μV)	Reading (μV)	Error (%)
Channel X	+ Input	200000	200000.3	0.00
Channel X	+ Input	20000	20004.24	0.02
Channel X	- Input	20000	-20002.46	0.01
Channel Y	+ Input	200000	200000.4	0.00
Channel Y	+ Input	20000	20002.60	0.01
Channel Y	- Input	20000	-20002.26	0.01
Channel Z	+ Input	200000	200000.6	0.00
Channel Z	+ Input	20000	20000.78	0.00
Channel Z	- Input	20000	-20005.75	0.03

Low Range		Input (μV)	Reading (μV)	Error (%)
Channel X	+ Input	2000	2000	0.00
Channel X	+ Input	200	199.37	-0.31
Channel X	- Input	200	-200.28	0.14
Channel Y	+ Input	2000	2000	0.00
Channel Y	+ Input	200	199.63	-0.19
Channel Y	- Input	200	-200.88	0.44
Channel Z	+ Input	2000	2000.1	0.00
Channel Z	+ Input	200	198.60	-0.70
Channel Z	- Input	200	-201.07	0.53

2. Common mode sensitivity

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Common mode Input Voltage (mV)	High Range Average Reading (μV)	Low Range Average Reading (μV)
Channel X	200	-7.46	-6.40
	- 200	10.00	6.86
Channel Y	200	-2.73	-2.45
	- 200	0.84	0.43
Channel Z	200	-10.91	-10.94
	- 200	7.89	8.22

3. Channel separation

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Input Voltage (mV)	Channel X (μV)	Channel Y (μV)	Channel Z (μV)
Channel X	200	-	3.08	-1.34
Channel Y	200	1.18	-	4.64
Channel Z	200	-1.74	1.44	-

4. AD-Converter Values with inputs shorted

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	High Range (LSB)	Low Range (LSB)
Channel X	16048	16021
Channel Y	16167	15166
Channel Z	16416	15977

5. Input Offset Measurement

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec
Input 10MΩ

	Average (μV)	min. Offset (μV)	max. Offset (μV)	Std. Deviation (μV)
Channel X	-0.13	-0.88	0.92	0.33
Channel Y	-0.88	-2.47	0.72	0.55
Channel Z	-1.16	-2.17	-0.19	0.42

6. Input Offset Current

Nominal Input circuitry offset current on all channels: <25fA

7. Input Resistance

	Zeroing (MOhm)	Measuring (MOhm)
Channel X	0.2000	201.1
Channel Y	0.2000	201.0
Channel Z	0.2001	201.7

8. Low Battery Alarm Voltage (verified during pre test)

Typical values	Alarm Level (VDC)
Supply (+ Vcc)	+7.9
Supply (- Vcc)	-7.6

9. Power Consumption (verified during pre test)

Typical values	Switched off (mA)	Stand by (mA)	Transmitting (mA)
Supply (+ Vcc)	+0.0	+6	+14
Supply (- Vcc)	–0.01	-8	-9

Appendix F - FCC 3G SAR Measurement Procedures

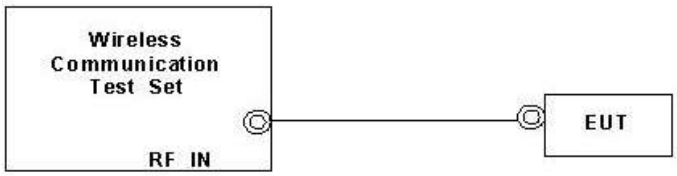
1. Conducted Output Power:

For FCC requirement, the MPR is implemented for HSPA (HSDPA & HSUPA) release 6. In this device, it is HSDPA release 5. The EUT was tested according to the requirements of the FCC 3G procedures and the TS 34.121. A detailed analysis of the output power for all WCDMA and HSPDA modes is provided in the tables below.

WCDMA SAR Test mode - Conducted Power							
Mode	Setup	Cell band (850)			PCS band (1900)		
		CH4132	CH4182	CH4233	CH9262	CH9400	CH9538
		826.4 (MHz)	836.4 (MHz)	846.6 (MHz)	1852.4 (MHz)	1880.0 (MHz)	1907.6 (MHz)
WCDMA R99	RMC 12.2Kbps	22.63	22.97	23.18	23.41	23.16	22.86
HSDPA R5	HSDPA - subtest 1	22.63	22.95	23.14	23.17	22.94	22.80
	HSDPA - subtest 2	22.58	23.02	23.11	23.45	22.95	22.59
	HSDPA - subtest 3	22.37	22.68	22.78	23.10	22.89	22.65
	HSDPA - subtest 4	22.28	22.66	22.86	22.93	22.51	22.12

2. WCDMA Setup Configuration:

a. The EUT was connected to Base Station referred to the drawing of Setup Configuration.
b. The RF path losses were compensated into the measurements.
c. A call was established between EUT and Base Station with following setting
   i. Data rates: Varied from RMC 12.2Kbps
   ii. RMC Test Loop=Loop Mode 1
   iii. Power Ctrl Mode= All Up bits
d. The transmitted maximum output power was recorded.



Setup Configuration

3. HSDPA Setup Configuration:

a. The EUT was connected to Base Station referred to the drawing of Setup Configuration.
b. The RF path losses were compensated into the measurements.
c. A call was established between EUT and Base Station with following setting:
   i. Set Gain Factors(βc and βd) and parameters were set according to each
   ii. Specific sub-test in the following table, C10.1.4, quoted from the TS 34.121
   iii. Set RMC12.2Kbps + HSDPA mode
   iv. Set Cell Power = -86 dBm
   v. Set HS-DSCH Configuration Type to FRC (H-set 1, QPSK)
   vi. Select HSDPA Uplink Parameters
   vii. Set DeltaACK, DeltaNACK and DeltaCQI = 8
   viii. Set Ack-Nack Repetition Factor to 3
   ix. Set CQI Feedback Cycle (k) to 4 ms
   x. Set CQI Repetition Factor to 2
   xi. Power Ctrl Mode = All Up Bits
d. The transmitted maximum output power was recorded.

Table C.10.1.4: β values for transmitter characteristics tests with HS-DPCCH

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{HS} (Note1, Note 2)	CM (dB) (Note 3)	MPR (dB) (Note 3)
1	2/15	15/15	64	2/15	4/15	0.0	0.0
2	12/15 (Note 4)	15/15 (Note 4)	64	12/15 (Note 4)	24/15	1.0	0.0
3	15/15	8/15	64	15/8	30/15	1.5	0.5
4	15/15	4/15	64	15/4	30/15	1.5	0.5

Note 1: Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 30/15 with β_{hs} = 30/15 * β_c.

Note 2: For the HS-DPCCH power mask requirement test in clause 5.2C, 5.7A, and the Error Vector Magnitude (EVM) with HS-DPCCH test in clause 5.13.1A, and HSDPA EVM with phase discontinuity in clause 5.13.1AA, Δ_{ACK} and Δ_{NACK} = 30/15 with β_{hs} = 30/15 * β_c, and Δ_{CQI} = 24/15 with β_{hs} = 24/15 * β_c.

Note 3: CM = 1 for β_c/β_d =12/15, β_{hs}/β_c=24/15. For all other combinations of DPDCH, DPCCH and HS-DPCCH the MPR is based on the relative CM difference. This is applicable for only UEs that support HSDPA in release 6 and later releases.

Note 4: For subtest 2 the β_c/β_d ratio of 12/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to β_c = 11/15 and β_d = 15/15.

Setup Configuration

4. Reference:

[1] 941225 D01 SAR test for 3G devices v02, SAR Measurement Procedures for 3G Devices CDMA 2000/Ev-Do/WCDMA/HSDPA/HSPA Oct. 2007 Laboratory Division Office of Engineering and Technology Federal Communications Commission

[2.] TS 34.121 Universal Mobile Telecommunications System (UMTS); Terminal Conformance Specification, Radio Transmission and Reception (FDD)

Appendix G - Analysis of Effective Frequency Interval of Probe

The probe calibrated frequency intervals are 900, 1750, 1950 and 2450 MHz for ET3DV6 sn1787 probe, and 900, 1810, 2300, 2600, 3500, 5200, 5300, 5500, 5600, 5800 MHz for EX3DV3 sn3514 probe, and the device test frequency intervals are 835, 1800 and 1900 MHz. Though the probe calibrated frequency intervals are not properly matched with the device test frequency intervals, the probe calibration report is valid and the probe is suitable for the SAR test on this device. The analysis is as below.

According to KDB450824, as measurements exceeding ±50 MHz for the frequency > 300 MHz, should follow the additional steps based on the following conditions.

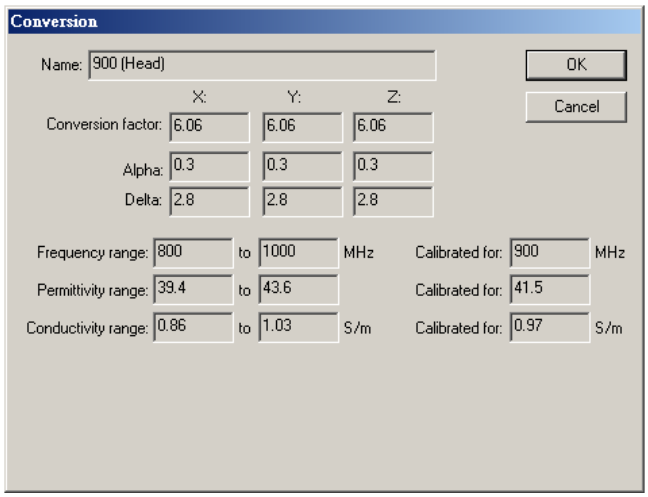
1. the actual tissue dielectric parameters used for the probe calibration are available
2. the nominal tissue dielectric parameters are specified for the probe calibration data

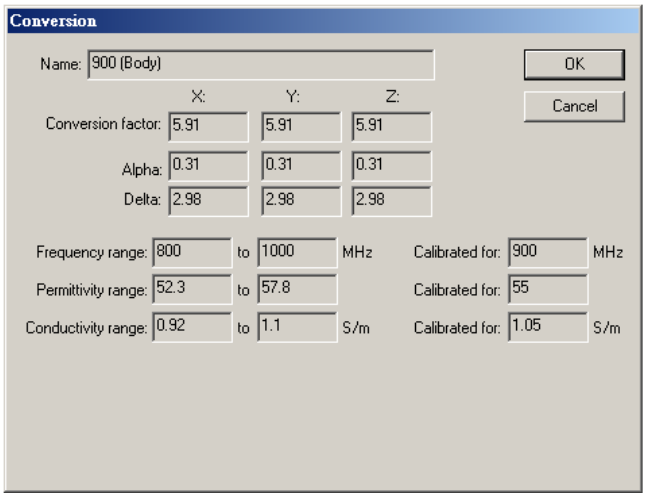
Because the nominal tissue dielectric parameters are specified in our probe calibration report, we will follow the condition 2 to verify its effectiveness.

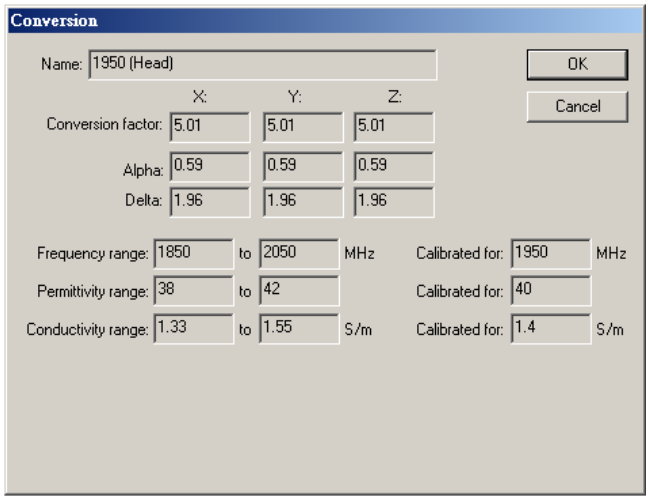
The list of permittivity and conductivity at the calibrated centre frequency are as follow:

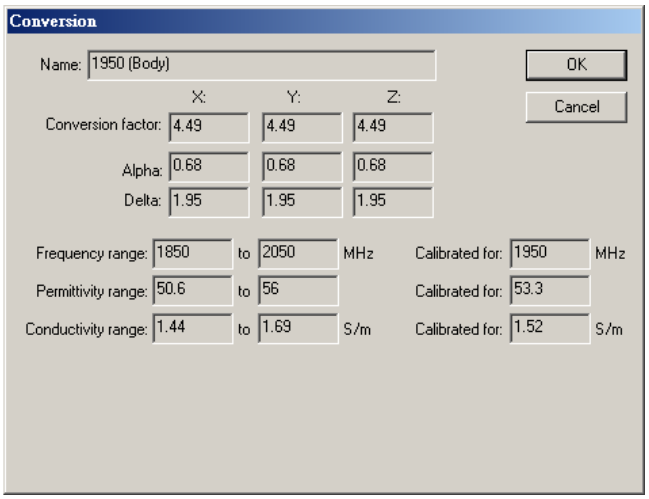
Frequency (MHz)	Type	Permittivity	Conductivity
900	Head	41.5	0.97
	Body	55.0	1.05
1810	Head	40.0	1.40
	Body	53.3	1.52
1950	Head	40.0	1.40
	Body	53.3	1.52

<For Probe ET3DV6 sn1787>

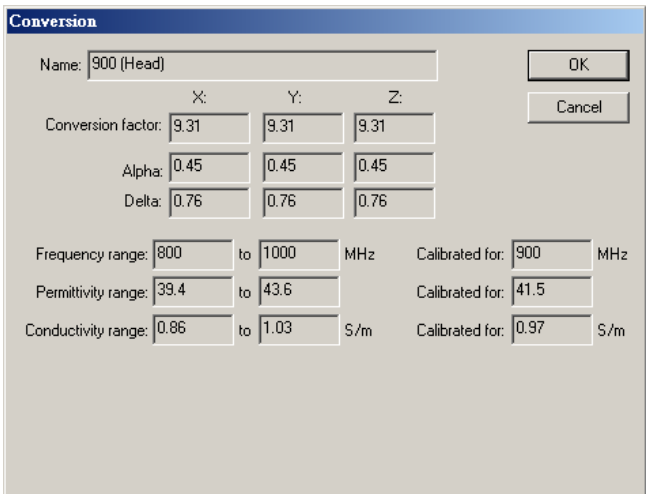


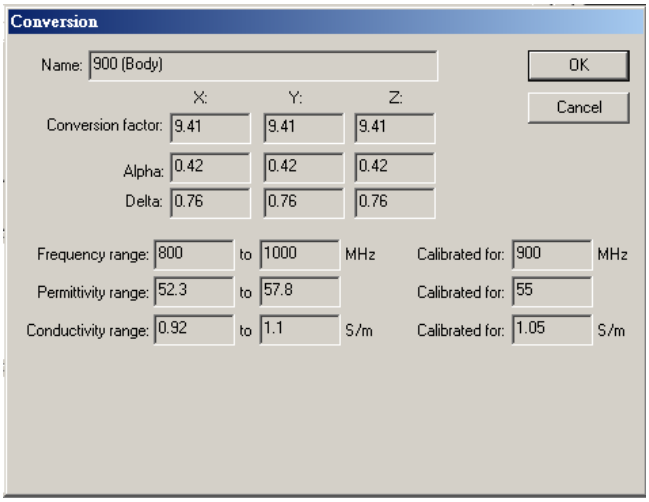


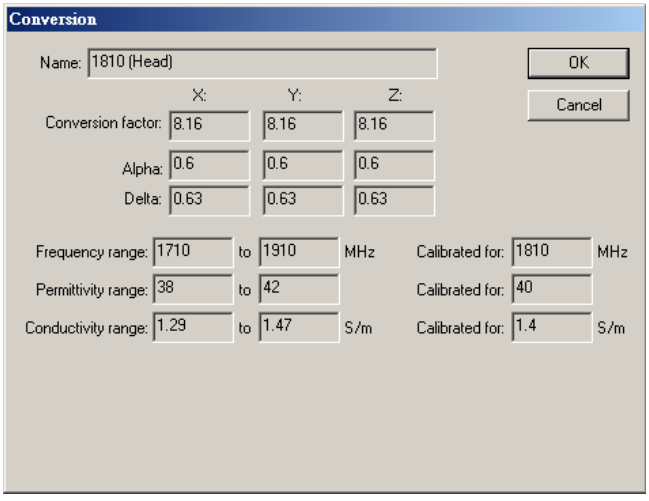


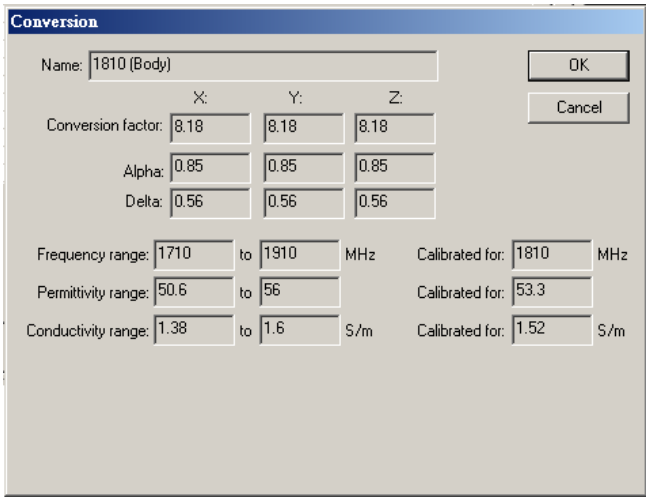


<For Probe EX3DV3 sn3514>









The list of target permittivity and conductivity are shown as follow, which is within the parameter range of the probe.

Frequency (MHz)	Type	Permittivity	Conductivity
835	Head	41.5	0.90
	Body	55.2	0.97
1800 & 1900	Head	40.0	1.40
	Body	53.3	1.52

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

<For Probe ET3DV6 sn1787>

f [MHz]	Validity [MHz][C]	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)

[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.

Certificate No: ET3-1787_Aug08 Page 8 of 9

ET3DV6 SN:1787 August 26, 2008

DASY - Parameters of Probe: ET3DV6 SN:1787

Sensitivity in Free Space[A] Diode Compression[B]

NormX	1.63 ± 10.1%	$\mu V/(V/m)^2$	DCP X	90 mV
NormY	1.67 ± 10.1%	$\mu V/(V/m)^2$	DCP Y	93 mV
NormZ	2.18 ± 10.1%	$\mu V/(V/m)^2$	DCP Z	92 mV

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_{be} [%]	Without Correction Algorithm	11.3	7.5
SAR_{be} [%]	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_{be} [%]	Without Correction Algorithm	10.1	6.5
SAR_{be} [%]	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%.

[A] The uncertainties of NormX,Y,Z do not affect the E^2-field uncertainty inside TSL (see Page 8).

[B] Numerical linearization parameter: uncertainty not required.

<For Probe EX3DV3 sn3514>

f [MHz]	Validity [MHz][C]	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
900	± 50 / ± 100	Head	41.5 ± 5%	0.97 ± 5%	0.45	0.76	9.31 ± 11.0% (k=2)
1810	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.60	0.63	8.16 ± 11.0% (k=2)
2300	± 50 / ± 100	Head	39.4 ± 5%	1.71 ± 5%	0.53	0.63	7.78 ± 11.0% (k=2)
2600	± 50 / ± 100	Head	39.0 ± 5%	1.96 ± 5%	0.16	2.19	7.34 ± 11.0% (k=2)
3500	± 50 / ± 100	Head	37.9 ± 5%	2.91 ± 5%	0.50	0.86	6.89 ± 13.1% (k=2)
5200	± 50 / ± 100	Head	36.0 ± 5%	4.66 ± 5%	0.40	1.70	4.78 ± 13.1% (k=2)
5300	± 50 / ± 100	Head	35.9 ± 5%	4.76 ± 5%	0.40	1.70	4.40 ± 13.1% (k=2)
5500	± 50 / ± 100	Head	35.6 ± 5%	4.96 ± 5%	0.40	1.70	4.22 ± 13.1% (k=2)
5600	± 50 / ± 100	Head	35.5 ± 5%	5.07 ± 5%	0.40	1.70	4.13 ± 13.1% (k=2)
5800	± 50 / ± 100	Head	35.3 ± 5%	5.27 ± 5%	0.40	1.70	4.13 ± 13.1% (k=2)
900	± 50 / ± 100	Body	55.0 ± 5%	1.05 ± 5%	0.42	0.76	9.41 ± 11.0% (k=2)
1810	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.85	0.56	8.18 ± 11.0% (k=2)
2300	± 50 / ± 100	Body	52.8 ± 5%	1.85 ± 5%	0.18	4.17	7.60 ± 11.0% (k=2)
2600	± 50 / ± 100	Body	52.5 ± 5%	2.16 ± 5%	0.34	1.14	7.20 ± 11.0% (k=2)
3500	± 50 / ± 100	Body	51.3 ± 5%	3.31 ± 5%	0.53	0.81	6.40 ± 13.1% (k=2)
5200	± 50 / ± 100	Body	49.0 ± 5%	5.30 ± 5%	0.45	1.75	4.29 ± 13.1% (k=2)
5300	± 50 / ± 100	Body	48.9 ± 5%	5.42 ± 5%	0.45	1.75	3.94 ± 13.1% (k=2)
5500	± 50 / ± 100	Body	48.6 ± 5%	5.65 ± 5%	0.45	1.75	3.88 ± 13.1% (k=2)
5600	± 50 / ± 100	Body	48.5 ± 5%	5.77 ± 5%	0.45	1.75	3.89 ± 13.1% (k=2)
5800	± 50 / ± 100	Body	48.2 ± 5%	6.00 ± 5%	0.45	1.75	3.85 ± 13.1% (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.

Certificate No: EX3-3514_Jan09 Page 8 of 9

EX3DV3 SN:3514 January 21, 2009

DASY - Parameters of Probe: EX3DV3 SN:3514

Sensitivity in Free Space[A] Diode Compression[B]

NormX	**0.66** ± 10.1%	$\mu V/(V/m)^2$	DCP X	**91** mV
NormY	**0.70** ± 10.1%	$\mu V/(V/m)^2$	DCP Y	**94** mV
NormZ	**0.60** ± 10.1%	$\mu V/(V/m)^2$	DCP Z	**95** mV

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		**2.0 mm**	**3.0 mm**
SAR_{be} [%]	Without Correction Algorithm	7.7	4.4
SAR_{be} [%]	With Correction Algorithm	0.8	0.3

TSL **1810 MHz** **Typical SAR gradient: 10 % per mm**

Sensor Center to Phantom Surface Distance		**2.0 mm**	**3.0 mm**
SAR_{be} [%]	Without Correction Algorithm	6.2	3.4
SAR_{be} [%]	With Correction Algorithm	0.7	0.3

Sensor Offset

Probe Tip to Sensor Center	**1.0** 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%.

[A] The uncertainties of NormX,Y,Z do not affect the E^2-field uncertainty inside TSL (see Page 8).

[B] Numerical linearization parameter: uncertainty not required.

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

In this report, the measured SAR values are all below 10% of the SAR limit.

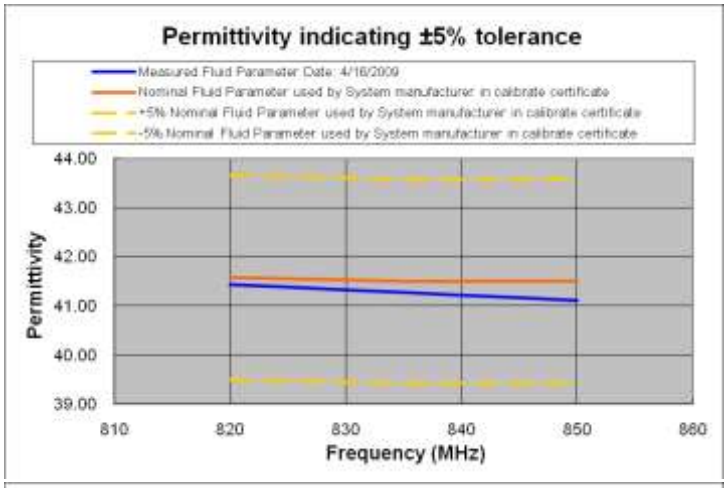
The measured fluid dielectric parameters for 835 MHz and 1900 MHz, for SAR test were all within ±5 % of the 835 MHz and 1900 MHz target value.

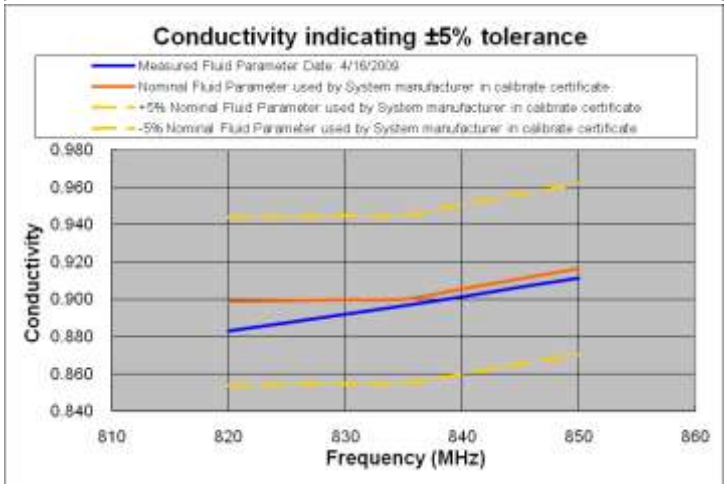
According to the following plots, the tissue dielectric parameter measured for routine measurements at 835 MHz body SAR was less than the target $\varepsilon_{r,}$ and higher than the target σ.

However, for 835 MHz head SAR, and 1900 MHz head and body SAR, the measured σ is not higher than the target σ for the whole frequency range. Therefore, the worst SAR was compensated with respect to +5 % tolerance in $\varepsilon_{r,}$ and -5 % tolerance in σ to reduce SAR underestimation.

<For GSM850 Head SAR, Measurement Date: Apr. 16, 2009>

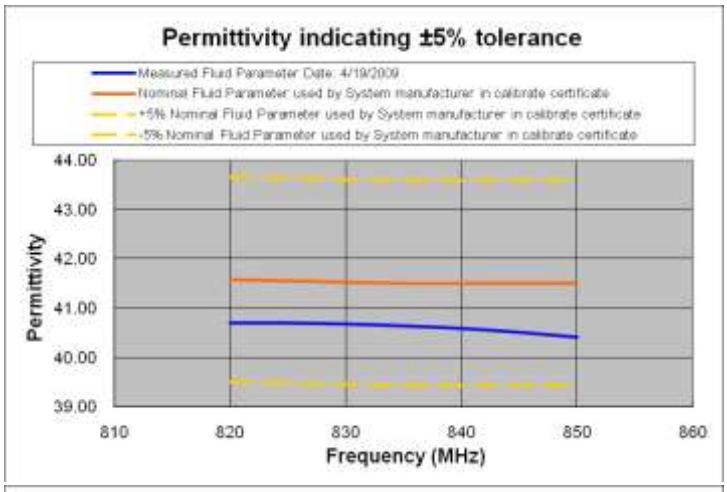
Frequency (MHz)	Measured Fluid Parameter Date: 4/16/2009 εr	Measured Fluid Parameter Date: 4/16/2009 σ	Nominal Fluid Parameter used by System manufacturer in calibrate certificate εr	Nominal Fluid Parameter used by System manufacturer in calibrate certificate σ
820	41.44	0.883	41.58	0.90
825	41.39	0.887	41.55	0.90
830	41.33	0.892	41.53	0.90
835	41.28	0.896	41.50	0.90
840	41.22	0.901	41.50	0.91
845	41.17	0.906	41.50	0.91
850	41.11	0.911	41.50	0.92

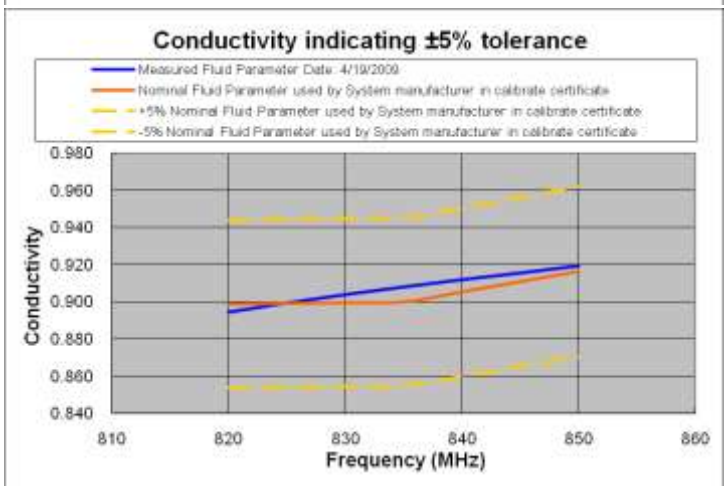




<For GSM850 Head SAR, Measurement Date: Apr. 19, 2009>

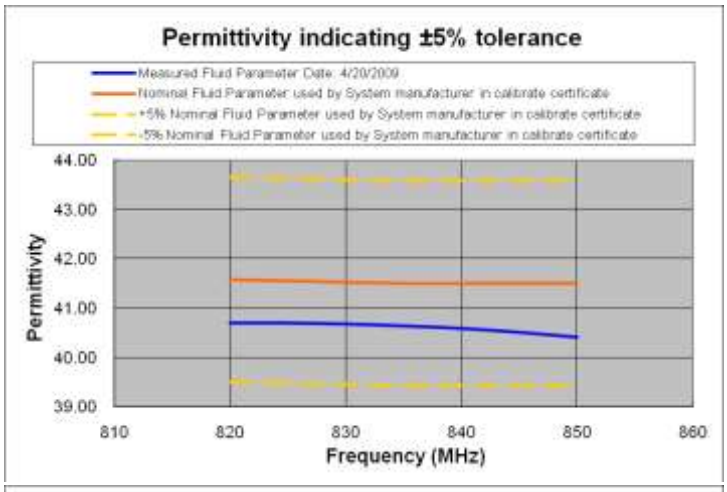
Frequency (MHz)	Measured Fluid Parameter Date: 4/19/2009		Nominal Fluid Parameter used by System manufacturer in calibrate certificate	
	εr	σ	εr	σ
820	40.70	0.894	41.58	0.90
825	40.70	0.899	41.55	0.90
830	40.68	0.904	41.53	0.90
835	40.64	0.908	41.50	0.90
840	40.59	0.912	41.50	0.91
845	40.51	0.915	41.50	0.91
850	40.41	0.919	41.50	0.92

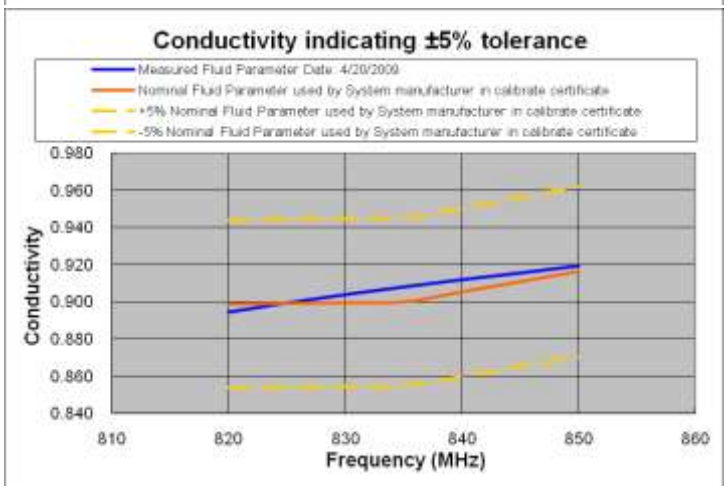




<For GSM850 Head SAR, Measurement Date: Apr. 20, 2009>

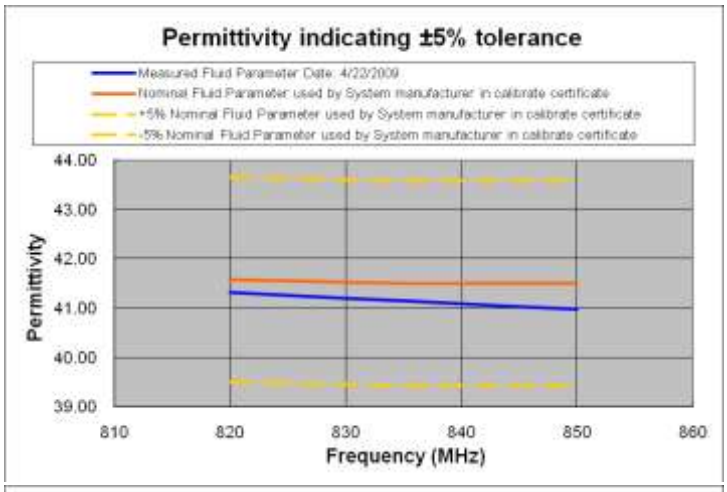
Frequency (MHz)	Measured Fluid Parameter Date: 4/20/2009 εr	Measured Fluid Parameter Date: 4/20/2009 σ	Nominal Fluid Parameter used by System manufacturer in calibrate certificate εr	Nominal Fluid Parameter used by System manufacturer in calibrate certificate σ
820	40.70	0.894	41.58	0.90
825	40.70	0.899	41.55	0.90
830	40.68	0.904	41.53	0.90
835	40.64	0.908	41.50	0.90
840	40.59	0.912	41.50	0.91
845	40.51	0.915	41.50	0.91
850	40.41	0.919	41.50	0.92

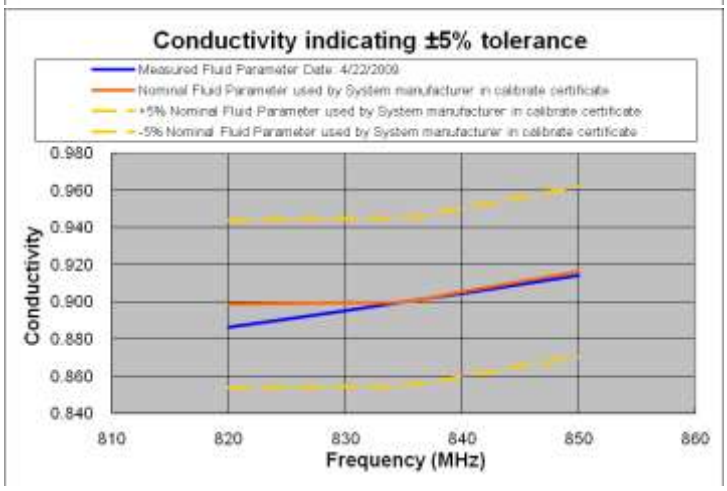




<For GSM850 Head SAR, Measurement Date: Apr. 22, 2009>

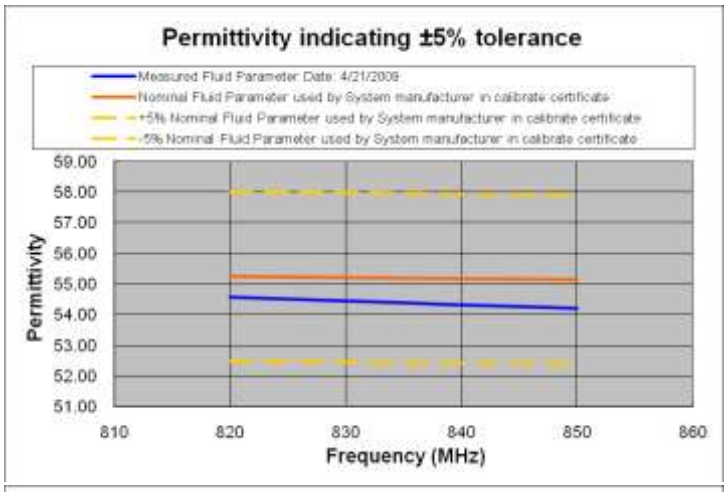
	Measured Fluid Parameter Date: 4/22/2009		Nominal Fluid Parameter used by System manufacturer in calibrate certificate	
Frequency (MHz)	εr	σ	εr	σ
820	41.32	0.887	41.58	0.90
825	41.26	0.891	41.55	0.90
830	41.20	0.895	41.53	0.90
835	41.15	0.900	41.50	0.90
840	41.09	0.905	41.50	0.91
845	41.03	0.910	41.50	0.91
850	40.98	0.914	41.50	0.92

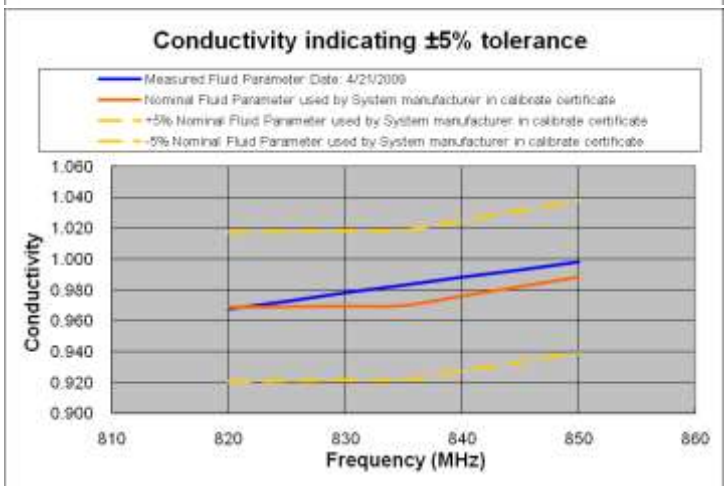




<For GSM850 Body SAR, Measurement Date: Apr. 21, 2009>

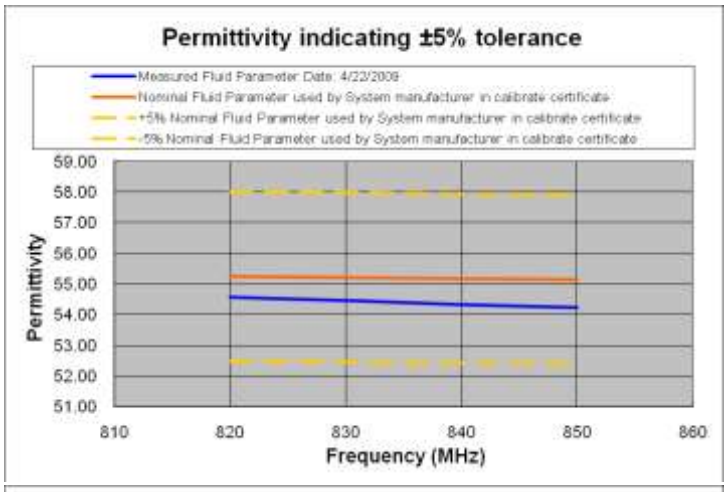
Frequency (MHz)	Measured Fluid Parameter Date: 4/21/2009 εr	Measured Fluid Parameter Date: 4/21/2009 σ	Nominal Fluid Parameter used by System manufacturer in calibrate certificate εr	Nominal Fluid Parameter used by System manufacturer in calibrate certificate σ
820	54.57	0.968	55.26	0.97
825	54.51	0.972	55.24	0.97
830	54.45	0.978	55.22	0.97
835	54.39	0.983	55.20	0.97
840	54.32	0.988	55.18	0.98
845	54.27	0.993	55.17	0.98
850	54.21	0.998	55.15	0.99

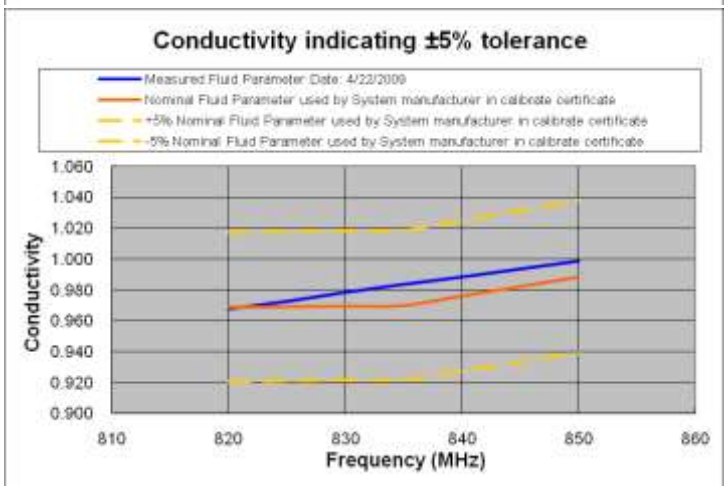




<For GSM850 Body SAR, Measurement Date: Apr. 22, 2009>

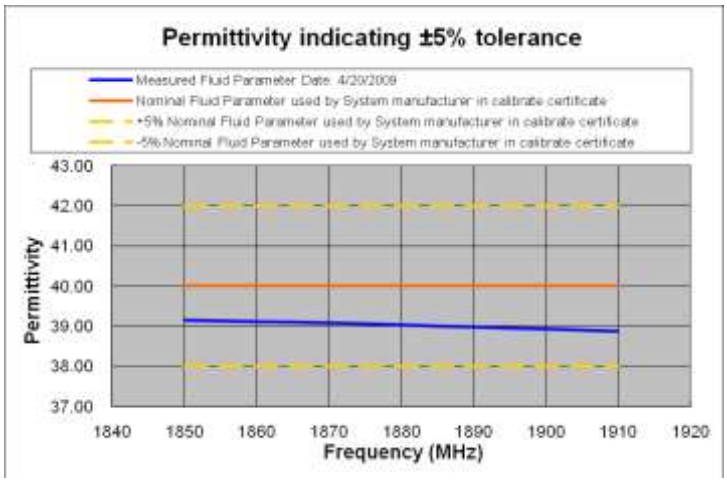
Frequency (MHz)	Measured Fluid Parameter Date: 4/22/2009 εr	Measured Fluid Parameter Date: 4/22/2009 σ	Nominal Fluid Parameter used by System manufacturer in calibrate certificate εr	Nominal Fluid Parameter used by System manufacturer in calibrate certificate σ
820	54.58	0.968	55.26	0.97
825	54.52	0.973	55.24	0.97
830	54.47	0.979	55.22	0.97
835	54.40	0.984	55.20	0.97
840	54.33	0.989	55.18	0.98
845	54.28	0.994	55.17	0.98
850	54.23	0.999	55.15	0.99

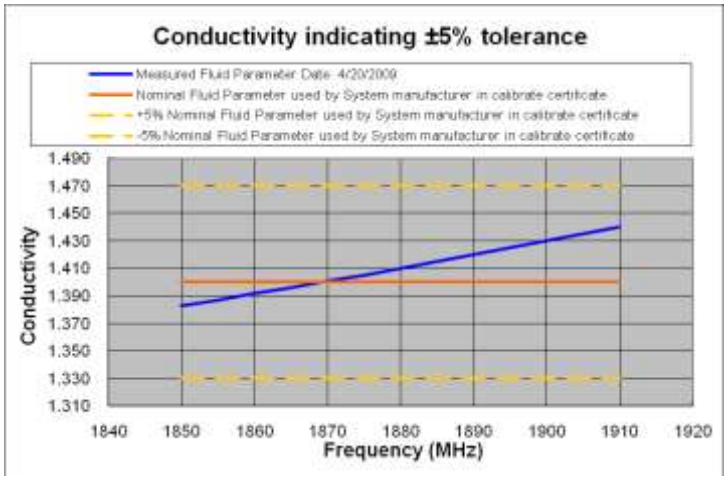




<For GSM1900 Head SAR, Measurement Date: Apr. 20, 2009>

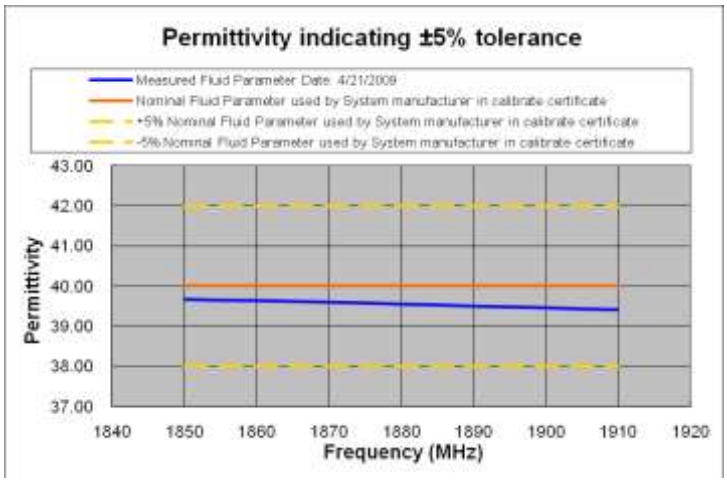
	Measured Fluid Parameter Date: 4/20/2009		Nominal Fluid Parameter used by System manufacturer in calibrate certificate	
Frequency (MHz)	εr	σ	εr	σ
1850	39.16	1.383	40.00	1.40
1855	39.14	1.387	40.00	1.40
1860	39.12	1.392	40.00	1.40
1865	39.11	1.396	40.00	1.40
1870	39.09	1.401	40.00	1.40
1875	39.07	1.405	40.00	1.40
1880	39.04	1.410	40.00	1.40
1885	39.01	1.415	40.00	1.40
1890	38.99	1.420	40.00	1.40
1895	38.96	1.425	40.00	1.40
1900	38.94	1.430	40.00	1.40
1905	38.91	1.435	40.00	1.40
1910	38.88	1.440	40.00	1.40

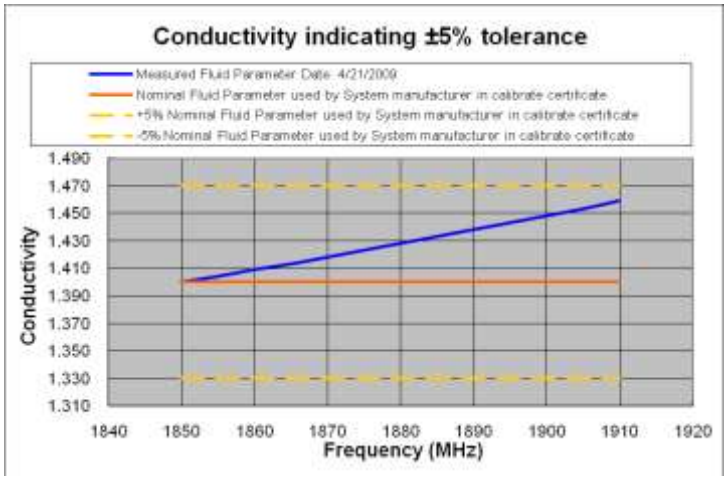




<For GSM1900 Head SAR, Measurement Date: Apr. 21, 2009>

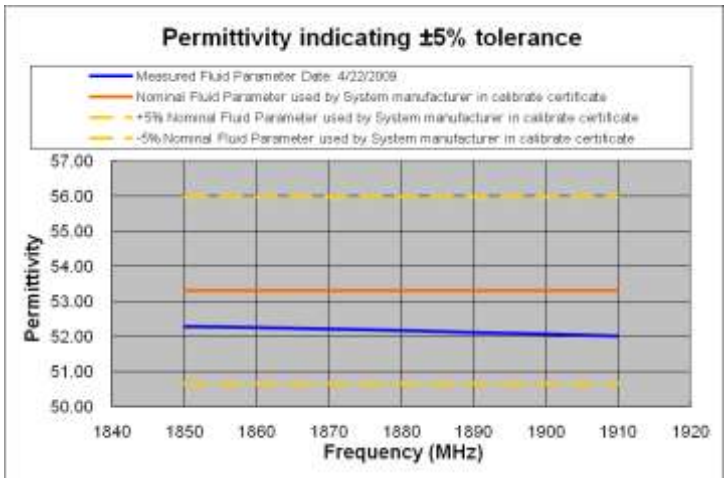
	Measured Fluid Parameter Date: 4/21/2009		Nominal Fluid Parameter used by System manufacturer in calibrate certificate	
Frequency (MHz)	εr	σ	εr	σ
1850	39.67	1.400	40.00	1.40
1855	39.65	1.404	40.00	1.40
1860	39.64	1.409	40.00	1.40
1865	39.62	1.413	40.00	1.40
1870	39.60	1.418	40.00	1.40
1875	39.58	1.423	40.00	1.40
1880	39.55	1.428	40.00	1.40
1885	39.53	1.433	40.00	1.40
1890	39.50	1.438	40.00	1.40
1895	39.48	1.443	40.00	1.40
1900	39.46	1.448	40.00	1.40
1905	39.43	1.453	40.00	1.40
1910	39.41	1.459	40.00	1.40

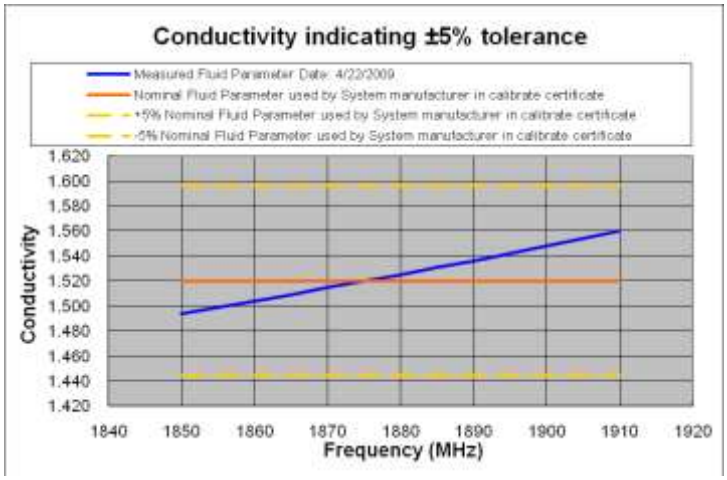




<For GSM1900 Body SAR, Measurement Date: Apr. 22, 2009>

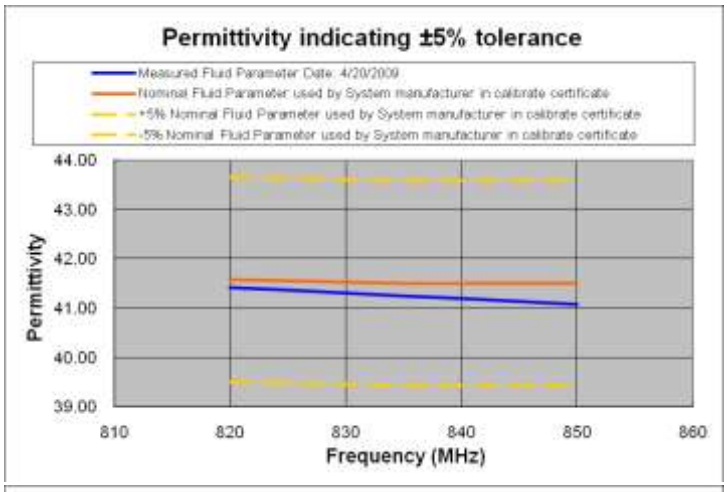
	Measured Fluid Parameter Date: 4/22/2009		Nominal Fluid Parameter used by System manufacturer in calibrate certificate	
Frequency (MHz)	εr	σ	εr	σ
1850	52.27	1.494	53.30	1.52
1855	52.26	1.499	53.30	1.52
1860	52.24	1.504	53.30	1.52
1865	52.22	1.509	53.30	1.52
1870	52.20	1.515	53.30	1.52
1875	52.18	1.520	53.30	1.52
1880	52.16	1.525	53.30	1.52
1885	52.13	1.531	53.30	1.52
1890	52.10	1.536	53.30	1.52
1895	52.08	1.542	53.30	1.52
1900	52.06	1.548	53.30	1.52
1905	52.03	1.554	53.30	1.52
1910	52.00	1.560	53.30	1.52

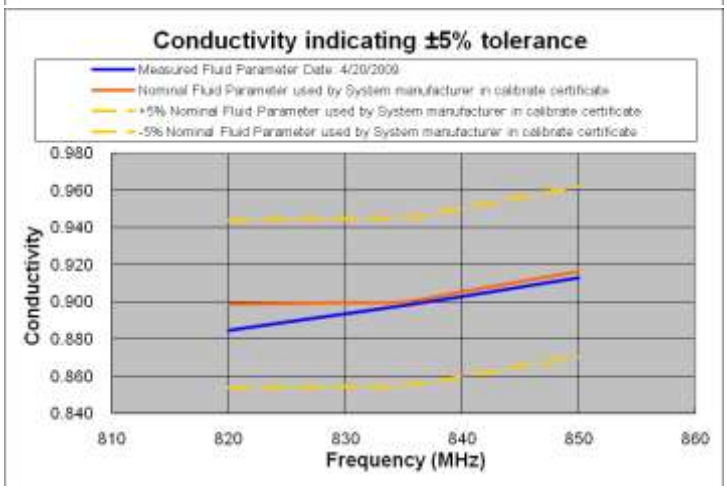




<For WCDMA Band V Head SAR, Measurement Date: Apr. 20, 2009>

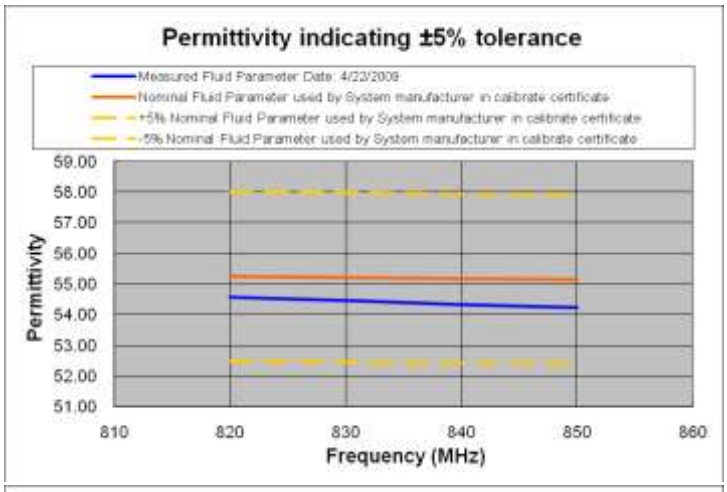
	Measured Fluid Parameter Date: 4/20/2009		Nominal Fluid Parameter used by System manufacturer in calibrate certificate	
Frequency (MHz)	εr	σ	εr	σ
820	41.42	0.885	41.58	0.90
825	41.37	0.889	41.55	0.90
830	41.31	0.894	41.53	0.90
835	41.25	0.898	41.50	0.90
840	41.20	0.903	41.50	0.91
845	41.14	0.908	41.50	0.91
850	41.08	0.913	41.50	0.92

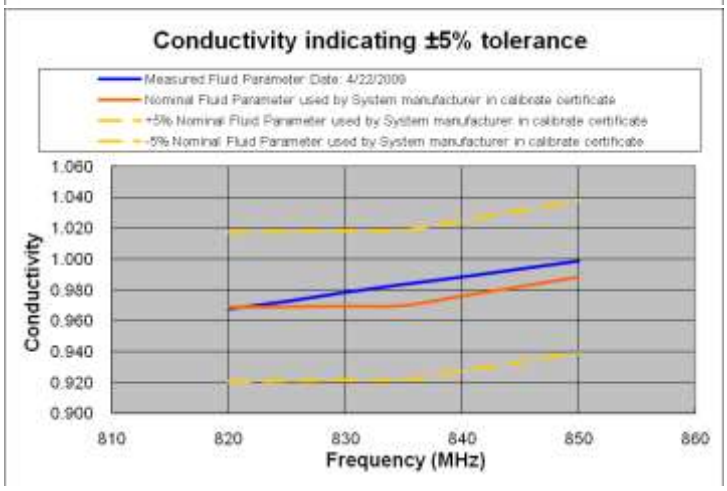




<For WCDMA Band V Body SAR, Measurement Date: Apr. 22, 2009>

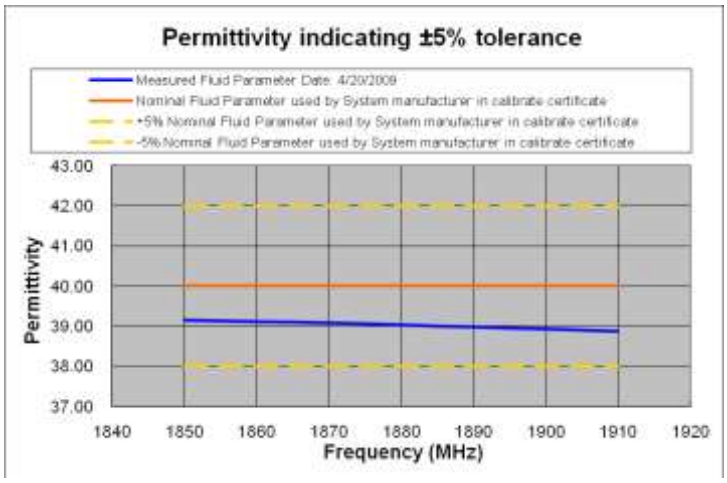
	Measured Fluid Parameter Date: 4/22/2009		Nominal Fluid Parameter used by System manufacturer in calibrate certificate	
Frequency (MHz)	εr	σ	εr	σ
820	54.58	0.968	55.26	0.97
825	54.52	0.973	55.24	0.97
830	54.47	0.979	55.22	0.97
835	54.40	0.984	55.20	0.97
840	54.33	0.989	55.18	0.98
845	54.28	0.994	55.17	0.98
850	54.23	0.999	55.15	0.99

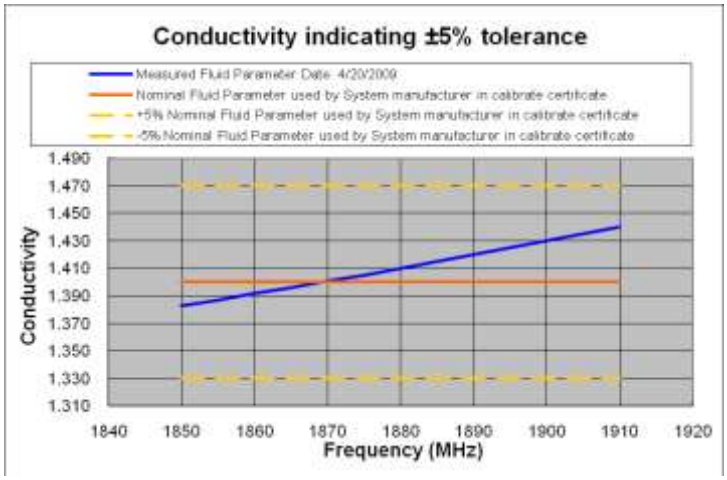




<For WCDMA Band II Head SAR, Measurement Date: Apr. 20, 2009>

	Measured Fluid Parameter Date: 4/20/2009		Nominal Fluid Parameter used by System manufacturer in calibrate certificate	
Frequency (MHz)	εr	σ	εr	σ
1850	39.16	1.383	40.00	1.40
1855	39.14	1.387	40.00	1.40
1860	39.12	1.392	40.00	1.40
1865	39.11	1.396	40.00	1.40
1870	39.09	1.401	40.00	1.40
1875	39.07	1.405	40.00	1.40
1880	39.04	1.410	40.00	1.40
1885	39.01	1.415	40.00	1.40
1890	38.99	1.420	40.00	1.40
1895	38.96	1.425	40.00	1.40
1900	38.94	1.430	40.00	1.40
1905	38.91	1.435	40.00	1.40
1910	38.88	1.440	40.00	1.40





<For WCDMA Band II Head SAR, Measurement Date: Apr. 21, 2009>

Frequency (MHz)	Measured Fluid Parameter Date: 4/21/2009 εr	Measured Fluid Parameter Date: 4/21/2009 σ	Nominal Fluid Parameter used by System manufacturer in calibrate certificate εr	Nominal Fluid Parameter used by System manufacturer in calibrate certificate σ
1850	39.67	1.400	40.00	1.40
1855	39.65	1.404	40.00	1.40
1860	39.64	1.409	40.00	1.40
1865	39.62	1.413	40.00	1.40
1870	39.60	1.418	40.00	1.40
1875	39.58	1.423	40.00	1.40
1880	39.55	1.428	40.00	1.40
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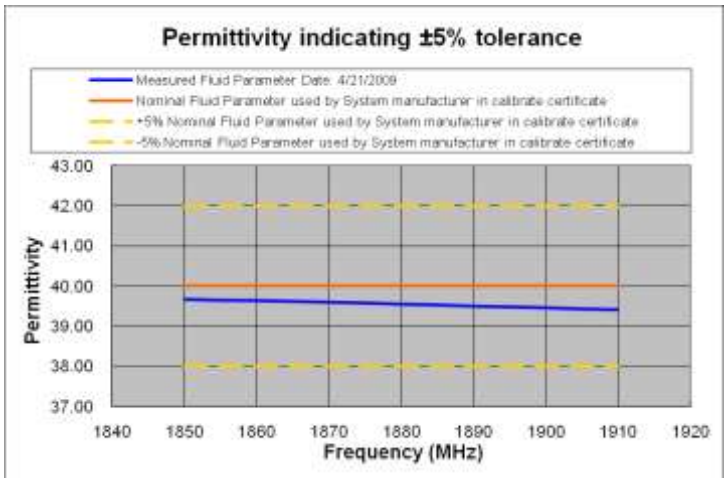
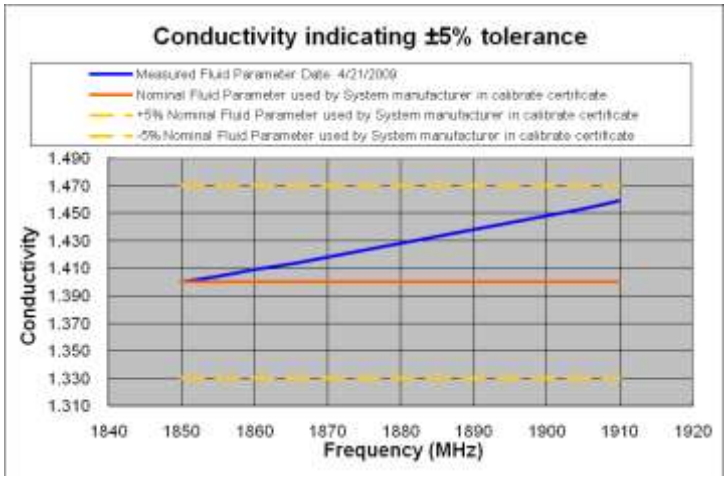
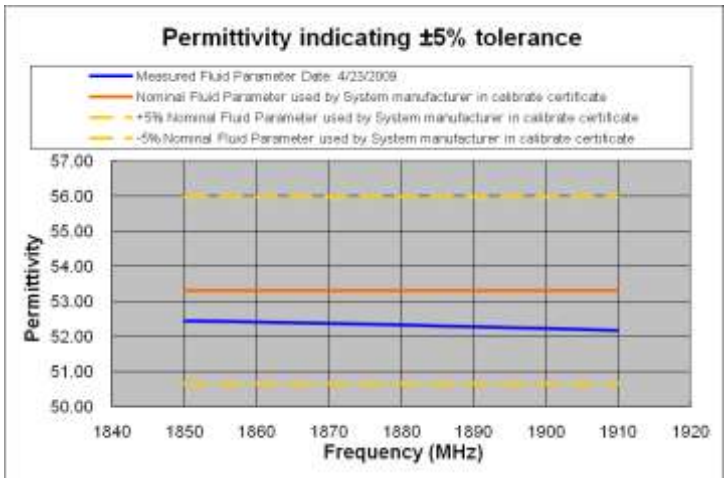
1890	39.50	1.438	40.00	1.40
1895	39.48	1.443	40.00	1.40
1900	39.46	1.448	40.00	1.40
1905	39.43	1.453	40.00	1.40
1910	39.41	1.459	40.00	1.40

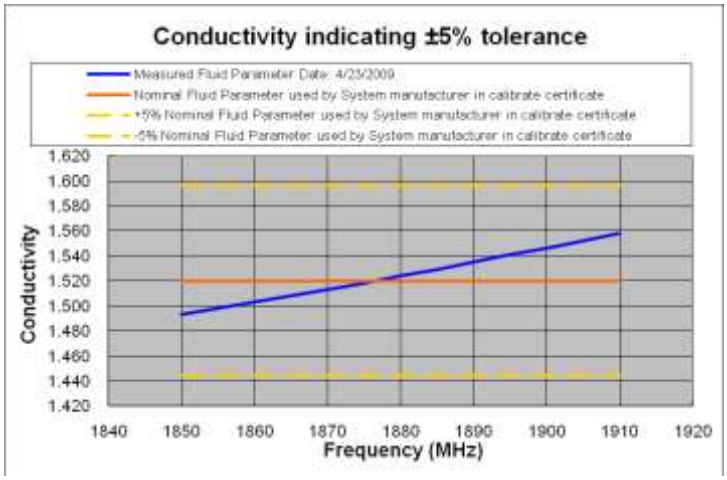




<For WCDMA Band II Body SAR, Measurement Date: Apr. 23, 2009>

Frequency (MHz)	Measured Fluid Parameter Date: 4/23/2009 εr	Measured Fluid Parameter Date: 4/23/2009 σ	Nominal Fluid Parameter used by System manufacturer in calibrate certificate εr	Nominal Fluid Parameter used by System manufacturer in calibrate certificate σ
1850	52.43	1.493	53.30	1.52
1855	52.42	1.498	53.30	1.52
1860	52.40	1.503	53.30	1.52
1865	52.38	1.508	53.30	1.52
1870	52.36	1.513	53.30	1.52
1875	52.34	1.518	53.30	1.52
1880	52.32	1.524	53.30	1.52
1885	52.29	1.529	53.30	1.52
1890	52.27	1.535	53.30	1.52
1895	52.24	1.541	53.30	1.52
1900	52.22	1.546	53.30	1.52
1905	52.19	1.552	53.30	1.52
1910	52.16	1.558	53.30	1.52





The list of compensated value for worst SAR is as follow.

Band	Mode	Position	Channel	SAR_{1g}	Limit	Result
GSM850	Head	Right Cheek	251	0.876	1.6	Pass
GSM1900	Head	Right Cheek	661	0.367	1.6	Pass
GSM1900	Body	Bottom with 1.5 cm Gap	512	0.338	1.6	Pass
WCDMA Band V	Head	Right Cheek	4182	0.733	1.6	Pass
WCDMA Band II	Head	Right Cheek	9262	0.742	1.6	Pass
WCDMA Band II	Body	Bottom with 1.5 cm Gap	9262	0.661	1.6	Pass