

ET3DV6 SN:1733

September 4, 2007

DASY - Parameters of Probe: ET3DV6 SN:1733

Sensitivity in Free Space^A

NormX	1.52 ± 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$
NormY	1.50 ± 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$
NormZ	1.63 ± 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$

Diode Compression^B

DCP X	95 mV
DCP Y	92 mV
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	5.7	3.0
SAR _{be} [%]	With Correction Algorithm	0.3	0.1

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	11.7	8.0
SAR _{be} [%]	With Correction Algorithm	0.6	0.2

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 E²-field uncertainty inside TSL (see Page 8).

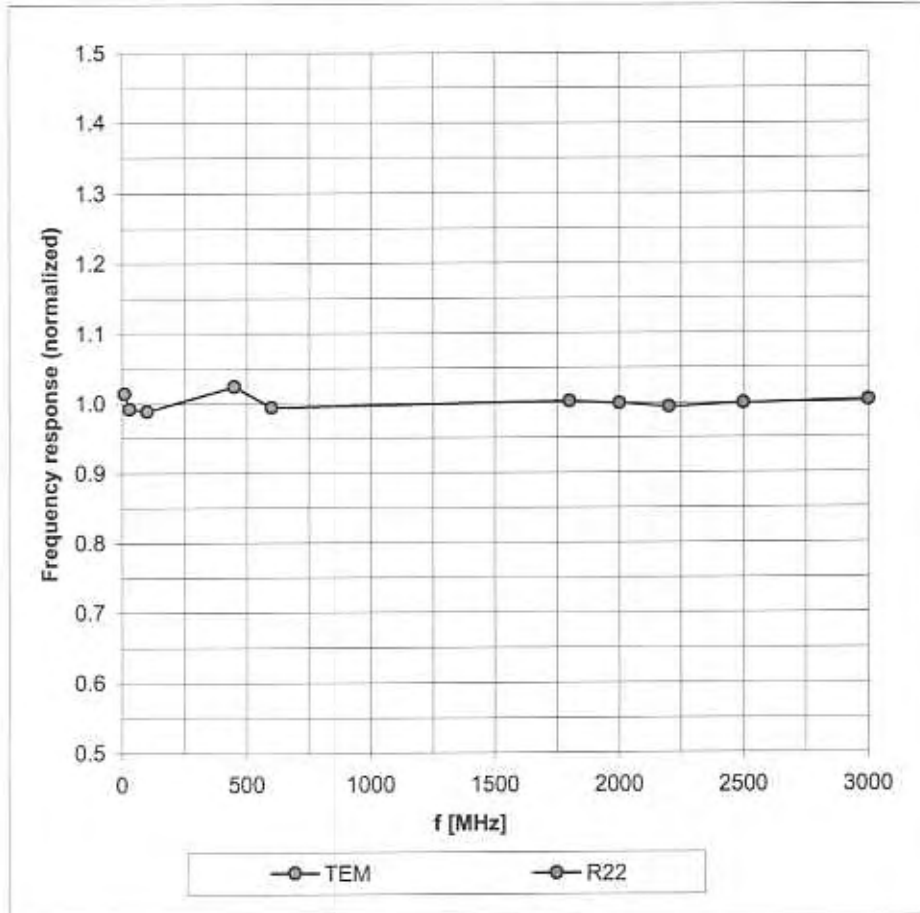
^B Numerical linearization parameter: uncertainty not required.

ET3DV6 SN:1733

September 4, 2007

Frequency Response of E-Field

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

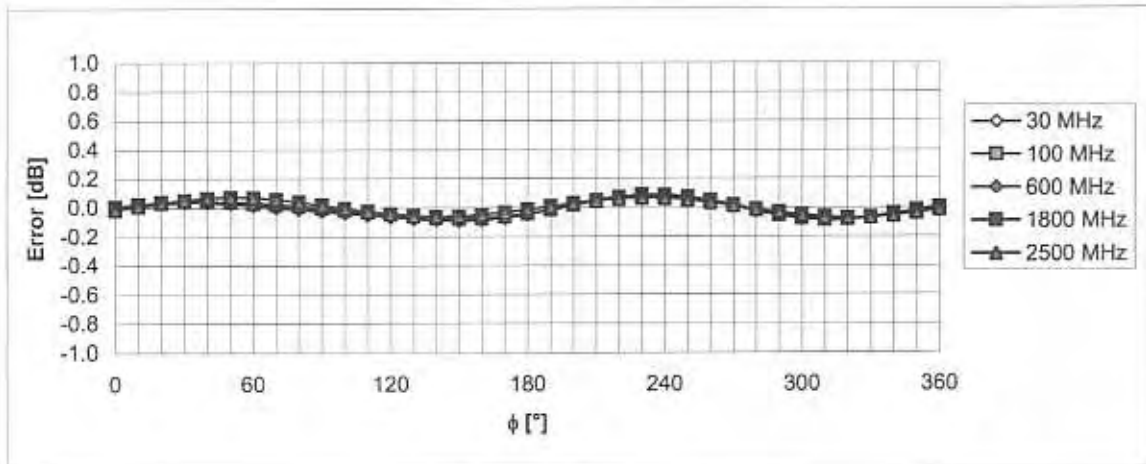
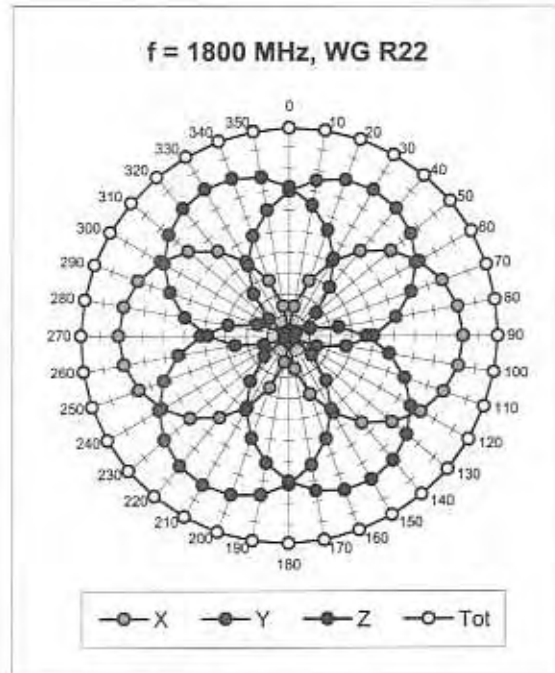
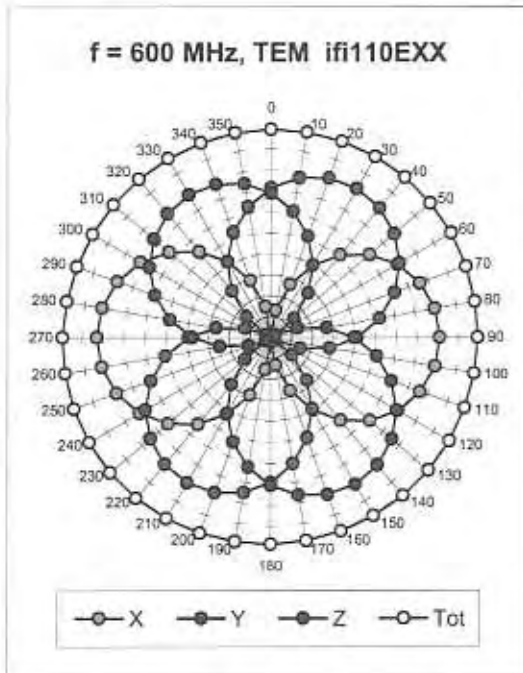


Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ (k=2)

ET3DV6 SN:1733

September 4, 2007

Receiving Pattern (ϕ), $\vartheta = 0^\circ$

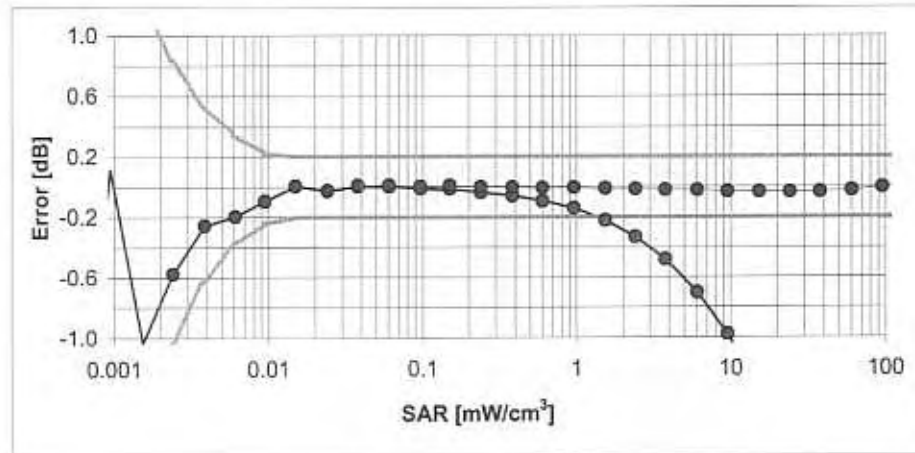
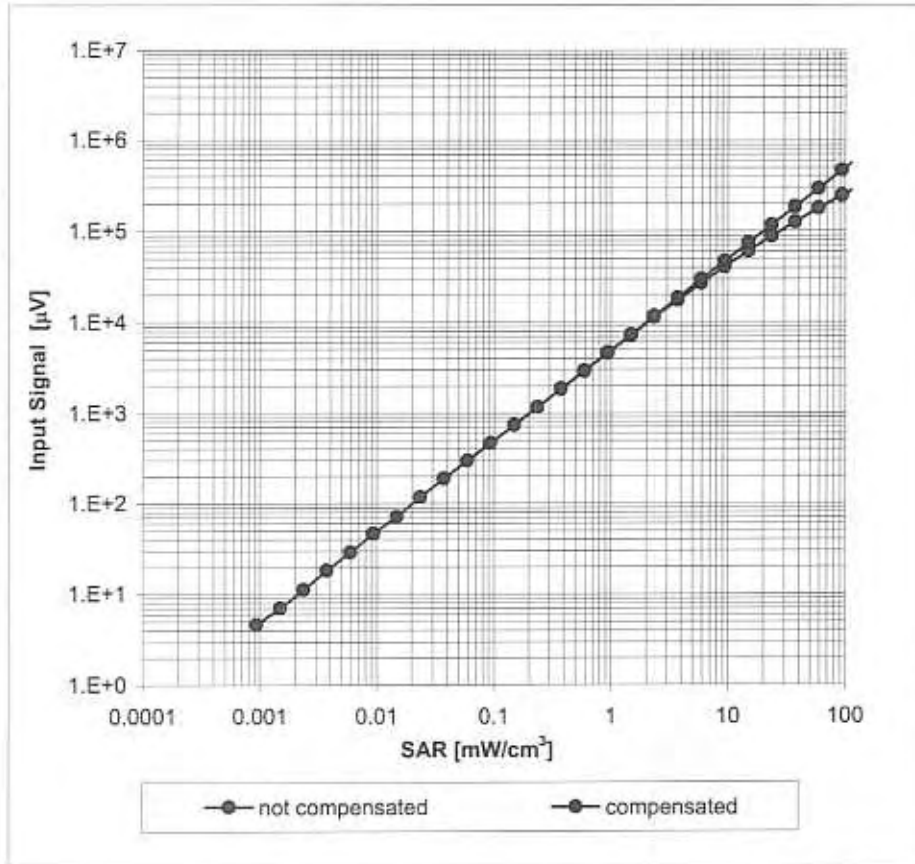


Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

ET3DV6 SN:1733

September 4, 2007

Dynamic Range $f(\text{SAR}_{\text{head}})$ (Waveguide R22, $f = 1800 \text{ MHz}$)

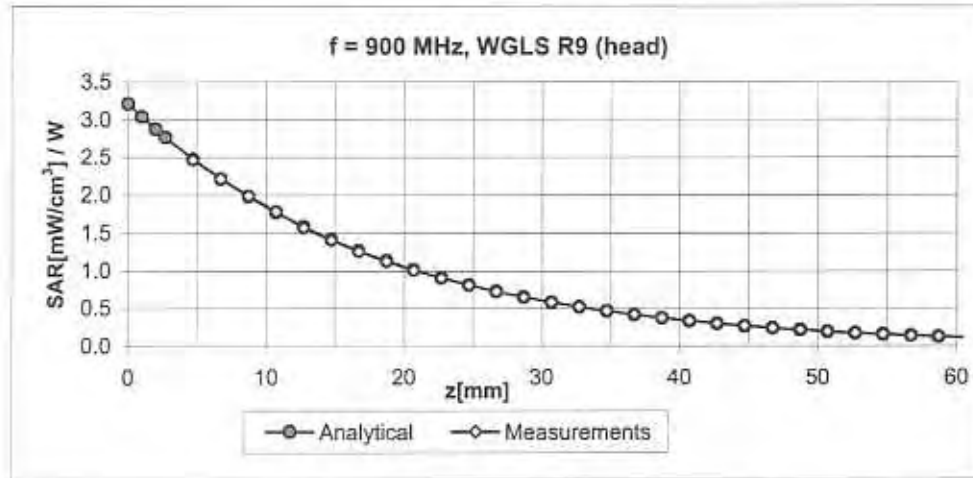


Uncertainty of Linearity Assessment: $\pm 0.6\%$ ($k=2$)

ET3DV6 SN:1733

September 4, 2007

Conversion Factor Assessment



f [MHz]	Validity [MHz] ^c	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
450	± 50 / ± 100	Head	43.5 ± 5%	0.87 ± 5%	0.36	1.83	7.34 ± 13.3% (k=2)
835	± 50 / ± 100	Head	41.5 ± 5%	0.90 ± 5%	0.24	2.89	6.89 ± 11.0% (k=2)
900	± 50 / ± 100	Head	41.5 ± 5%	0.97 ± 5%	0.29	2.89	6.72 ± 11.0% (k=2)
1640	± 50 / ± 100	Head	40.3 ± 5%	1.29 ± 5%	0.54	2.59	5.83 ± 11.0% (k=2)
1750	± 50 / ± 100	Head	40.1 ± 5%	1.37 ± 5%	0.64	2.36	5.42 ± 11.0% (k=2)
1900	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.55	2.77	5.24 ± 11.0% (k=2)
1950	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.55	2.75	5.06 ± 11.0% (k=2)
2450	± 50 / ± 100	Head	39.2 ± 5%	1.80 ± 5%	0.62	2.11	4.56 ± 11.8% (k=2)
450	± 50 / ± 100	Body	56.7 ± 5%	0.94 ± 5%	0.33	2.65	7.68 ± 13.3% (k=2)
835	± 50 / ± 100	Body	55.2 ± 5%	0.97 ± 5%	0.35	2.89	6.57 ± 11.0% (k=2)
900	± 50 / ± 100	Body	55.0 ± 5%	1.05 ± 5%	0.37	2.89	6.29 ± 11.0% (k=2)
1640	± 50 / ± 100	Body	53.8 ± 5%	1.40 ± 5%	0.50	2.84	5.27 ± 11.0% (k=2)
1750	± 50 / ± 100	Body	53.4 ± 5%	1.49 ± 5%	0.55	2.76	4.95 ± 11.0% (k=2)
1900	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.67	2.43	4.71 ± 11.0% (k=2)
1950	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.73	2.29	4.58 ± 11.0% (k=2)
2450	± 50 / ± 100	Body	52.7 ± 5%	1.95 ± 5%	0.65	2.17	3.93 ± 11.8% (k=2)

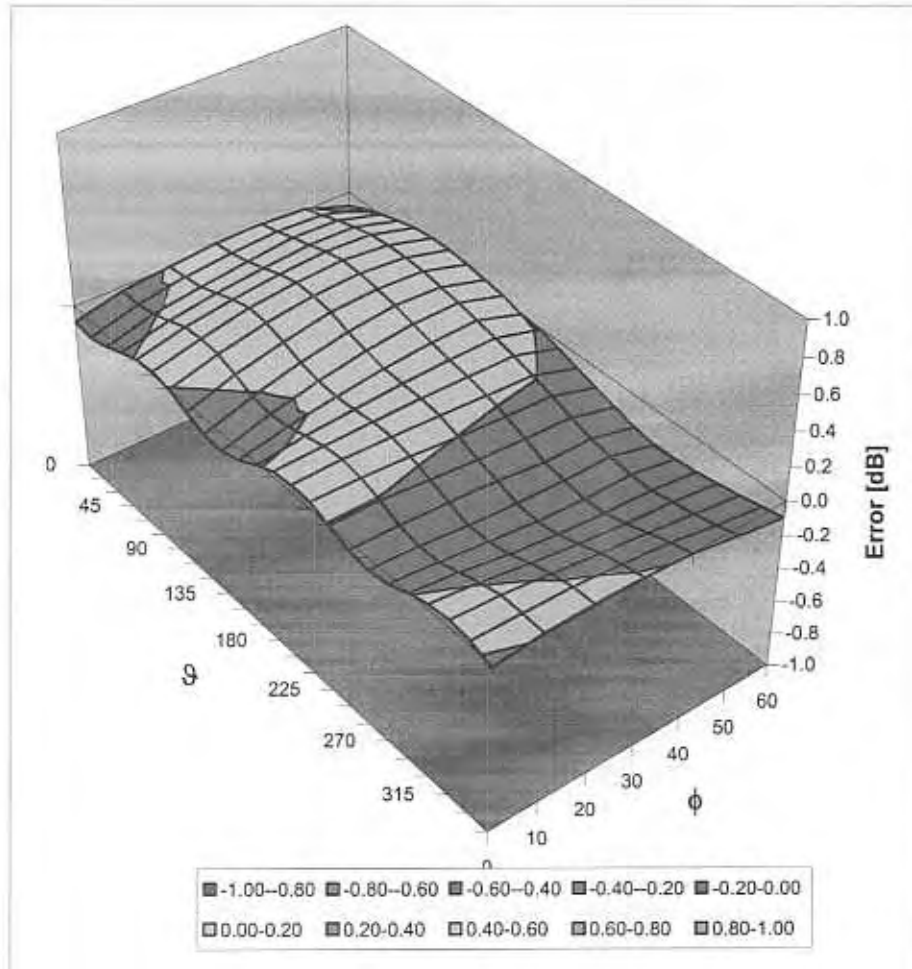
^c The validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2). The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

ET3DV6 SN:1733

September 4, 2007

Deviation from Isotropy in HSL

Error (ϕ, ϑ), $f = 900$ MHz



Uncertainty of Spherical Isotropy Assessment: $\pm 2.6\%$ ($k=2$)

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



S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
 The Swiss Accreditation Service is one of the signatories to the EA
 Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **Qualcomm USA**

Certificate No: **D1900V2-5d019_Nov07**

CALIBRATION CERTIFICATE

Object **D1900V2 - SN: 5d019**

Calibration procedure(s) **QA CAL-05.v7
 Calibration procedure for dipole validation kits**

Calibration date: **November 13, 2007**

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 (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	04-Oct-07 (METAS, No. 217-00736)	Oct-08
Power sensor HP 8481A	US37292783	04-Oct-07 (METAS, No. 217-00736)	Oct-08
Reference 20 dB Attenuator	SN: 5086 (20g)	07-Aug-07 (METAS, No 217-00718)	Aug-08
Reference 10 dB Attenuator	SN: 5047.2 (10r)	07-Aug-07 (METAS, No 217-00718)	Aug-08
Reference Probe ET3DV6 (HF)	SN: 1507	26-Oct-07 (SPEAG, No. ET3-1507_Oct07)	Oct-08
DAE4	SN 601	30-Jan-07 (SPEAG, No. DAE4-601_Jan07)	Jan-08

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (SPEAG, in house check Oct-07)	In house check: Oct-08
RF generator R&S SMT-06	100005	4-Aug-99 (SPEAG, in house check Oct-07)	In house check: Oct-09
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (SPEAG, in house check Oct-07)	In house check: Oct-08

Calibrated by: **Claudio Leubler** (Name), **Laboratory Technician** (Function), *[Signature]* (Signature)

Approved by: **Katja Pokovic** (Name), **Technical Manager** (Function), *[Signature]* (Signature)

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



S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
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
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

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
- c) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

Additional Documentation:

- d) DASY4 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY4	V4.7
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1900 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	38.8 ± 6 %	1.45 mho/m ± 6 %
Head TSL temperature during test	(21.4 ± 0.2) °C	—	—

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	condition	
SAR measured	250 mW input power	9.86 mW / g
SAR normalized	normalized to 1W	39.4 mW / g
SAR for nominal Head TSL parameters ¹	normalized to 1W	38.1 mW / g ± 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	5.15 mW / g
SAR normalized	normalized to 1W	20.6 mW / g
SAR for nominal Head TSL parameters ¹	normalized to 1W	20.2 mW / g ± 16.5 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	53.7 ± 6 %	1.54 mho/m ± 6 %
Body TSL temperature during test	(21.0 ± 0.2) °C	—	—

SAR result with Body TSL

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	9.32 mW / g
SAR normalized	normalized to 1W	37.3 mW / g
SAR for nominal Body TSL parameters ²	normalized to 1W	37.2 mW / g ± 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	4.99 mW / g
SAR normalized	normalized to 1W	20.0 mW / g
SAR for nominal Body TSL parameters ²	normalized to 1W	20.0 mW / g ± 16.5 % (k=2)

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	53.0 Ω + 2.3 j Ω
Return Loss	- 28.7 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	48.6 Ω + 3.0 j Ω
Return Loss	- 29.5 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.197 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	June 04, 2002

DASY4 Validation Report for Head TSL

Date/Time: 05.11.2007 14:23:55

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d019

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium: HSL U10 BB;

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.45$ mho/m; $\epsilon_r = 38.8$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1507 (HF); ConvF(4.86, 4.86, 4.86); Calibrated: 26.10.2007
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.01.2007
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; ;
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 172

Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0:

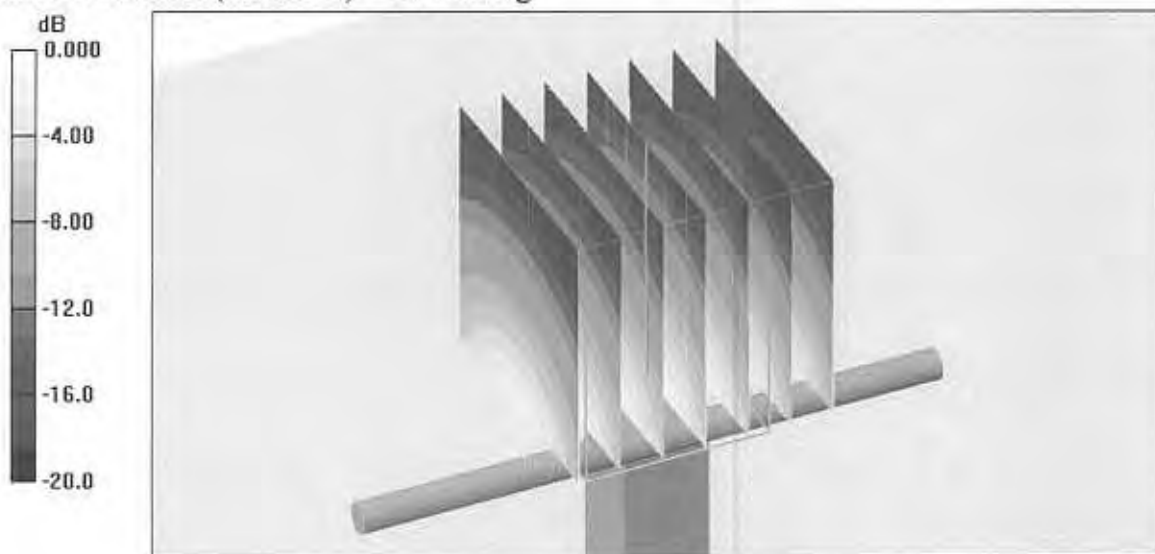
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 93.1 V/m; Power Drift = 0.036 dB

Peak SAR (extrapolated) = 17.4 W/kg

SAR(1 g) = 9.86 mW/g; SAR(10 g) = 5.15 mW/g

Maximum value of SAR (measured) = 11.1 mW/g

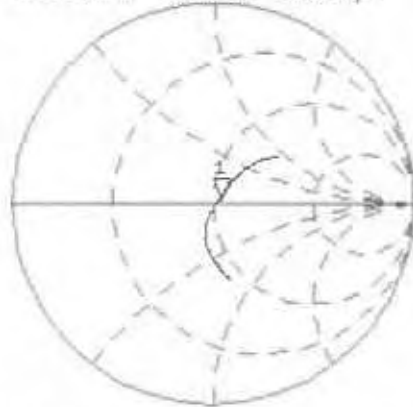


0 dB = 11.1mW/g

Impedance Measurement Plot for Head TSL

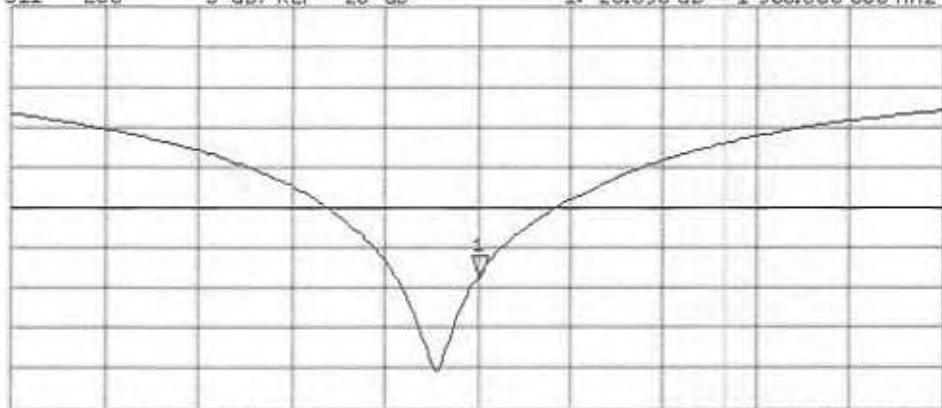
5 Nov 2007 11:59:58
CHI S11 1 U FS 1: 53.016 α 2.2949 α 192.24 μ H 1 900.000 000 MHz

Del
Ca
Avg
16



CH2 S11 LOG 5 dB/REF -20 dB 1: -28.690 dB 1 900.000 000 MHz

Ca
Avg
16



DASY4 Validation Report for Body TSL

Date/Time: 13.11.2007 14:09:19

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d019

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium: MSL U10 BB;

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.54$ mho/m; $\epsilon_r = 53.9$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1507 (HF); ConvF(4.48, 4.48, 4.48); Calibrated: 26.10.2007
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.01.2007
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; ;
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 172

Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0:

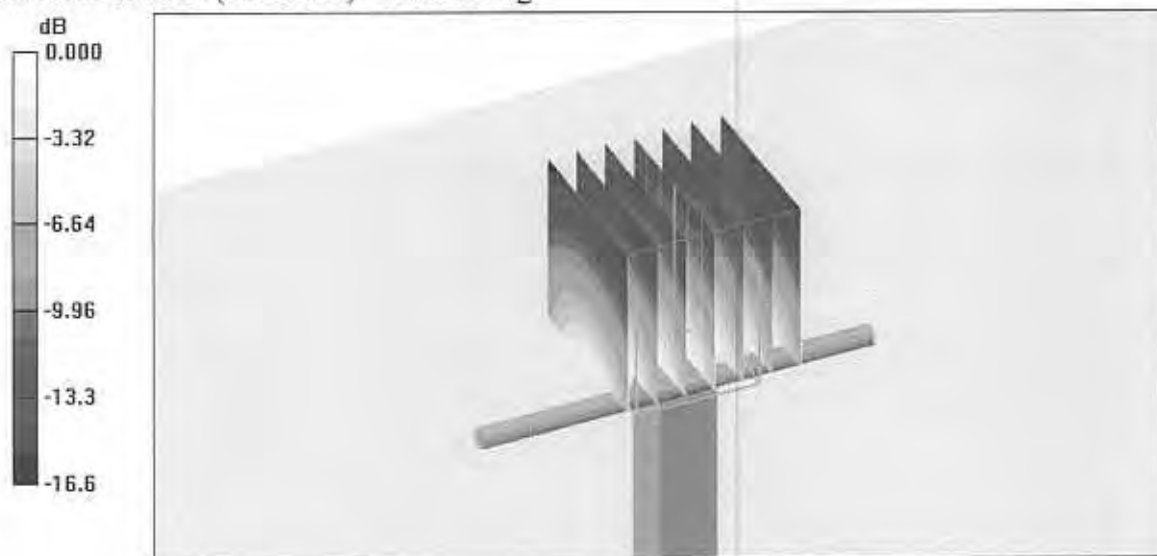
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 89.5 V/m; Power Drift = -0.006 dB

Peak SAR (extrapolated) = 15.9 W/kg

SAR(1 g) = 9.32 mW/g; SAR(10 g) = 4.99 mW/g

Maximum value of SAR (measured) = 10.6 mW/g

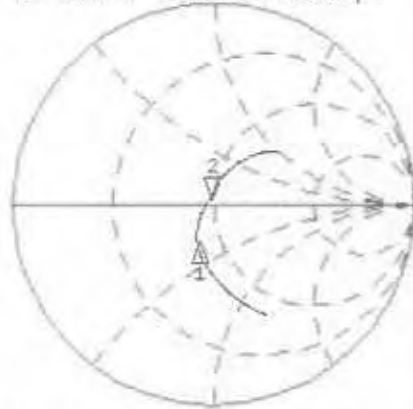


0 dB = 10.6mW/g

Impedance Measurement Plot for Body TSL

13 Nov 2007 11:02:07
CH1 S11 1 U FS 2: 48.611 Ω 3: 0.156 μ 252.61 pF 1 900.000 000 MHz

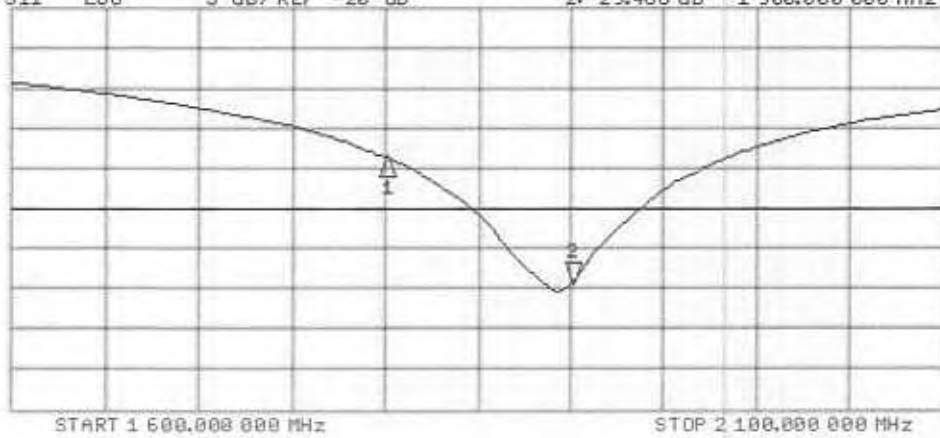
*
De1
Cor
Avg
16



CH1 Markers
1: 39.971 Ω
-15.096 μ
1.80000 GHz

CH2 S11 LOG 5 dB/REF -20 dB 2: -29.456 dB 1 900.000 000 MHz

Cor
Avg
16



CH2 Markers
1: -13.661 dB
1.80000 GHz

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



S Schweizerischer Kalibrierdienst
S Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
 The Swiss Accreditation Service is one of the signatories to the EA
 Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **Qualcomm USA**

Certificate No: **D835V2-466_Nov07**

CALIBRATION CERTIFICATE

Object **D835V2 - SN: 466**

Calibration procedure(s) **QA CAL-05.v7
 Calibration procedure for dipole validation kits**

Calibration date: **November 12, 2007**

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 (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	04-Oct-07 (METAS, No. 217-00736)	Oct-08
Power sensor HP 8481A	US37292783	04-Oct-07 (METAS, No. 217-00736)	Oct-08
Reference 20 dB Attenuator	SN: 5086 (20g)	07-Aug-07 (METAS, No 217-00718)	Aug-08
Reference 10 dB Attenuator	SN: 5047.2 (10r)	07-Aug-07 (METAS, No 217-00718)	Aug-08
Reference Probe ET3DV6 (HF)	SN 1507	26-Oct-07 (SPEAG, No. ET3-1507_Oct07)	Oct-08
DAE4	SN 601	30-Jan-07 (SPEAG, No. DAE4-601_Jan07)	Jan-08

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (SPEAG, in house check Oct-07)	In house check: Oct-09
RF generator R&S SMT-06	100005	04-Aug-99 (SPEAG, in house check Oct-07)	In house check: Oct-09
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (SPEAG, in house check Oct-07)	In house check: Oct-08

Calibrated by: **Name** Mike Meill **Function** Laboratory Technician **Signature** *[Signature]*

Approved by: **Name** Katja Pokovic **Function** Technical Manager **Signature** *[Signature]*

Issued: November 14, 2007

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

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



S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
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
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

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
- c) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

Additional Documentation:

- d) DASY4 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY4	V4.7
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V4.9	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.4 ± 6 %	0.88 mho/m ± 6 %
Head TSL temperature during test	(21.9 ± 0.2) °C	---	---

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.34 mW / g
SAR normalized	normalized to 1W	9.36 mW / g
SAR for nominal Head TSL parameters ¹	normalized to 1W	9.34 mW / g ± 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.53 mW / g
SAR normalized	normalized to 1W	6.12 mW / g
SAR for nominal Head TSL parameters ¹	normalized to 1W	6.09 mW / g ± 16.5 % (k=2)

¹ Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	55.2	0.97 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	54.9 ± 6 %	1.00 mho/m ± 6 %
Body TSL temperature during test	(22.0 ± 0.2) °C	---	---

SAR result with Body TSL

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.37 mW / g
SAR normalized	normalized to 1W	9.48 mW / g
SAR for nominal Body TSL parameters ²	normalized to 1W	9.27 mW / g ± 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.56 mW / g
SAR normalized	normalized to 1W	6.24 mW / g
SAR for nominal Body TSL parameters ²	normalized to 1W	6.15 mW / g ± 16.5 % (k=2)

² Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.1 Ω - 5.1 j Ω
Return Loss	- 25.3 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.5 Ω - 6.6 j Ω
Return Loss	- 22.8 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.384 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	August 27, 2002

DASY4 Validation Report for Head TSL

Date/Time: 07.11.2007 12:23:00

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:466

Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1

Medium: HSL 900 MHz;

Medium parameters used: $f = 835$ MHz; $\sigma = 0.88$ mho/m; $\epsilon_r = 40.4$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1507 (HF); ConvF(6.01, 6.01, 6.01); Calibrated: 26.10.2007
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.01.2007
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 172

Pin = 250 mW; d = 15 mm/Zoom Scan (7x7x7)/Cube 0:

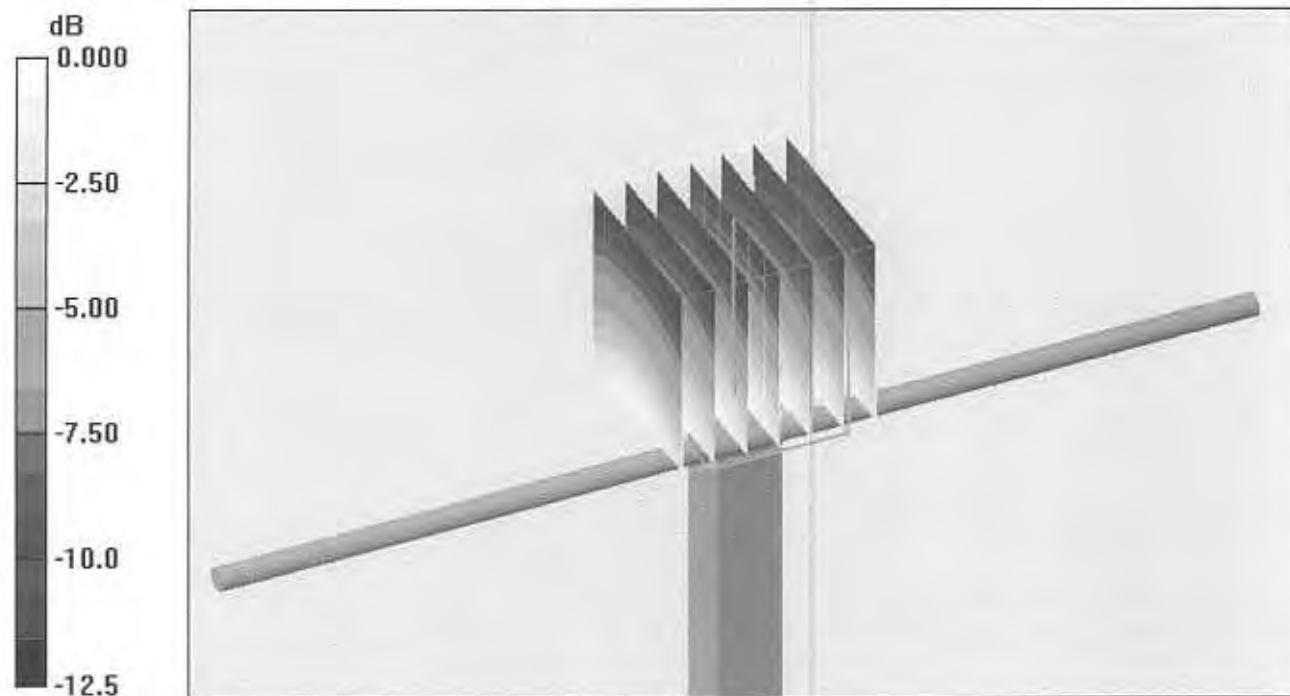
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 55.5 V/m; Power Drift = 0.024 dB

Peak SAR (extrapolated) = 3.44 W/kg

SAR(1 g) = 2.34 mW/g; SAR(10 g) = 1.53 mW/g

Maximum value of SAR (measured) = 2.51 mW/g

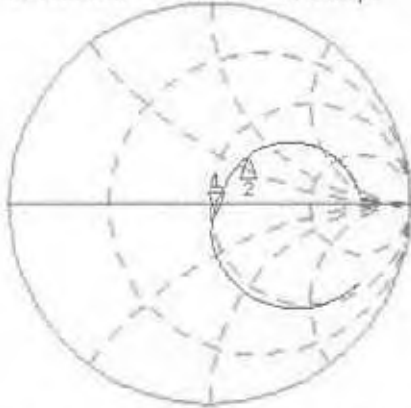


0 dB = 2.51mW/g

Impedance Measurement Plot for Head TSL

7 Nov 2007 11:48:42
CH1 S11 1 U FS 1: 52.111 Ω -5.1238 Ω 37.205 pF 835.000 000 MHz

*
De1
Cor



CH1 Markers
1: 52.116 Ω
2: 31.707 Ω
900.000 MHz

Avg
16

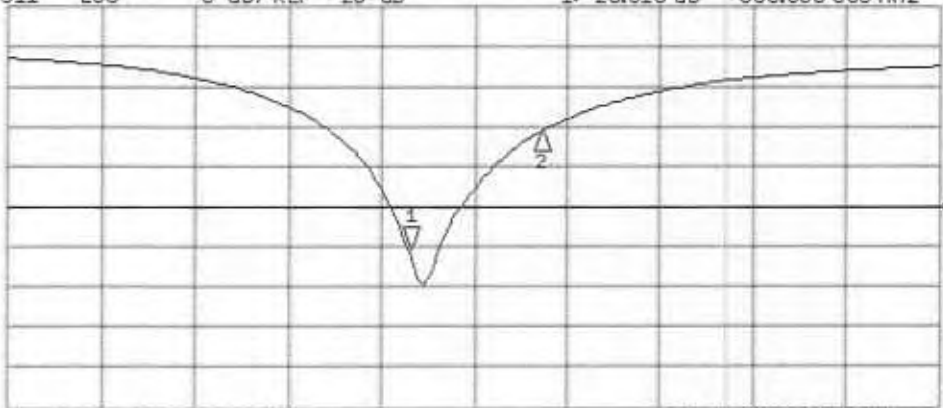
↑

CH2 S11 LOG 5 dB/REF -20 dB 1: -25.318 dB 835.000 000 MHz

Cor

Avg
16

↑



CH2 Markers
1: -10.688 dB
2: -10.688 dB
900.000 MHz

START 635.000 000 MHz

STOP 1100.000 000 MHz

DASY4 Validation Report for Body TSL

Date/Time: 12.11.2007 12:06:39

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:466

Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1

Medium: MSL900;

Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 1 \text{ mho/m}$; $\epsilon_r = 54.9$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1507 (HF); ConvF(5.83, 5.83, 5.83); Calibrated: 26.10.2007
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.01.2007
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; ;
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 172

Pin = 250mW, d = 15mm/Zoom Scan (7x7x7)/Cube 0:

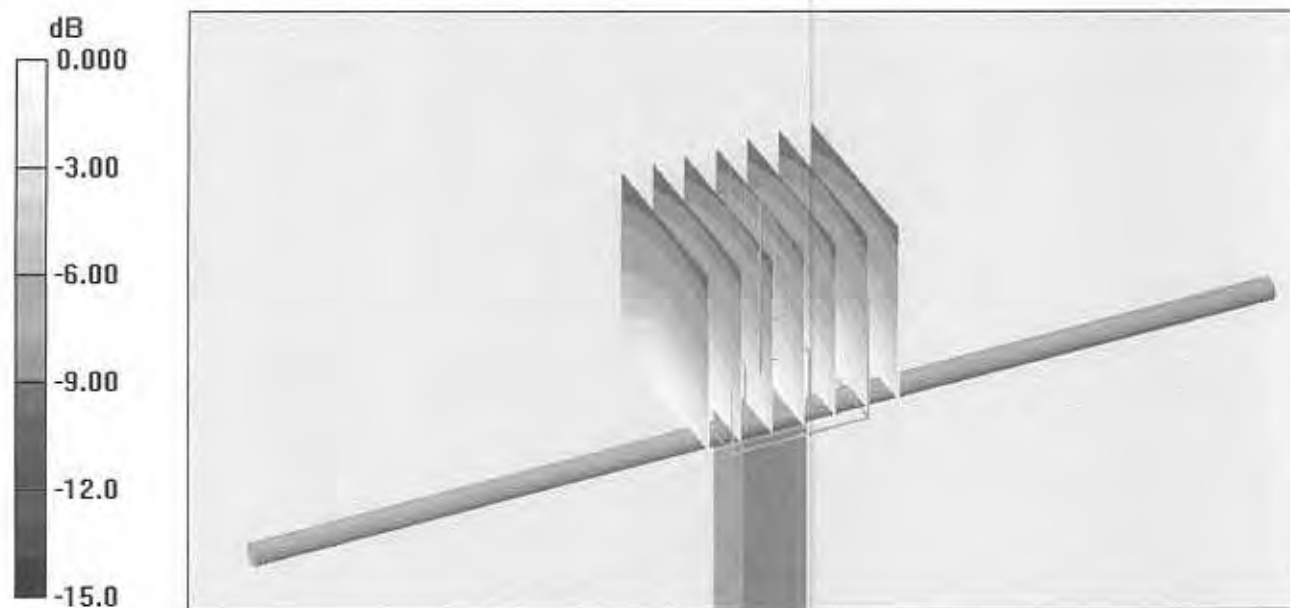
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 53.1 V/m; Power Drift = -0.015 dB

Peak SAR (extrapolated) = 3.41 W/kg

SAR(1 g) = 2.37 mW/g; SAR(10 g) = 1.56 mW/g

Maximum value of SAR (measured) = 2.56 mW/g

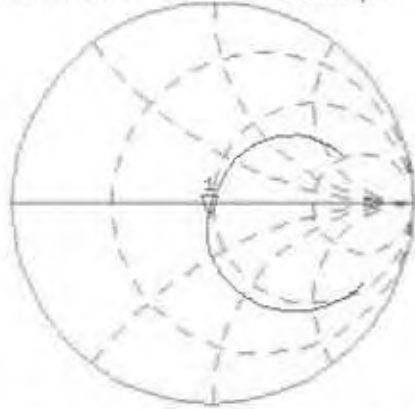


0 dB = 2.56mW/g

Impedance Measurement Plot for Body TSL

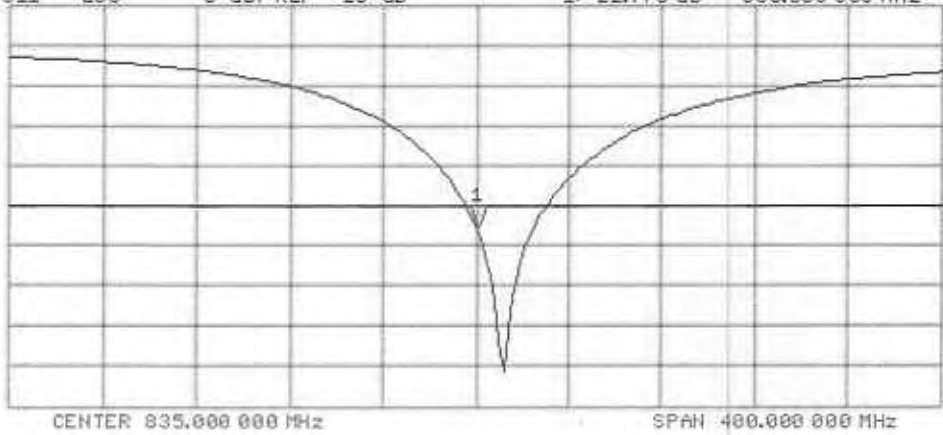
12 Nov 2007 11:54:33
[CH1] S11 1 U FS 1: 47.484 Ω -6.6328 Ω 28.737 pF 835.000 000 MHz

*
Del
CA
Avg
16
↑



CH2 S11 LOG 5 dB/REF -20 dB 1:-22.778 dB 835.000 000 MHz

CA
Avg
16
↑



X19701

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



S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
 The Swiss Accreditation Service is one of the signatories to the EA
 Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **Qualcomm USA**

Certificate No: **DAE3-400_Mar08**

CALIBRATION CERTIFICATE

Object **DAE3 - SD 000 D03 AA - SN: 400**

Calibration procedure(s) **QA CAL-06.v12
 Calibration procedure for the data acquisition electronics (DAE)**

Calibration date: **March 5, 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 (Calibrated by, Certificate No.)	Scheduled Calibration
Fluke Process Calibrator Type 702	SN: 6295803	04-Oct-07 (Elcal AG, No: 6467)	Oct-08
Keithley Multimeter Type 2001	SN: 0810278	03-Oct-07 (Elcal AG, No: 6465)	Oct-08
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Calibrator Box V1.1	SE UMS 006 AB 1004	25-Jun-07 (SPEAG, in house check)	In house check Jun-08

Calibrated by: **Name** Dominique Steffen **Function** Technician **Signature**

Approved by: **Name** Fin Bornholt **Function** R&D Director **Signature**

Issued, March 5, 2008

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

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



S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Federal Office of Metrology and Accreditation
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

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 = 6.1 μ V, 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	404.689 \pm 0.1% (k=2)	405.159 \pm 0.1% (k=2)	403.680 \pm 0.1% (k=2)
Low Range	3.96738 \pm 0.7% (k=2)	3.96885 \pm 0.7% (k=2)	3.91978 \pm 0.7% (k=2)

Connector Angle

Connector Angle to be used in DASY system	347 $^{\circ}$ \pm 1 $^{\circ}$
---	-----------------------------------

Appendix

1. DC Voltage Linearity

High Range	Input (μV)	Reading (μV)	Error (%)
Channel X + Input	200000	199999.6	0.00
Channel X + Input	20000	20006.05	0.03
Channel X - Input	20000	-20001.79	0.01
Channel Y + Input	200000	199999.8	0.00
Channel Y + Input	20000	20006.87	0.03
Channel Y - Input	20000	-19998.83	-0.01
Channel Z + Input	200000	200000	0.00
Channel Z + Input	20000	20004.03	0.02
Channel Z - Input	20000	-20004.39	0.02

Low Range	Input (μV)	Reading (μV)	Error (%)
Channel X + Input	2000	2000	0.00
Channel X + Input	200	199.82	-0.09
Channel X - Input	200	-199.40	-0.30
Channel Y + Input	2000	2000	0.00
Channel Y + Input	200	199.99	0.00
Channel Y - Input	200	-200.53	0.27
Channel Z + Input	2000	1999.9	0.00
Channel Z + Input	200	198.94	-0.53
Channel Z - Input	200	-200.89	0.44

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	-5.64	-7.20
	- 200	9.15	7.89
Channel Y	200	-8.45	-8.44
	- 200	7.61	7.76
Channel Z	200	20.82	20.67
	- 200	-20.24	-23.02

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	-	3.30	-0.21
Channel Y	200	1.14	-	4.22
Channel Z	200	-0.34	1.22	-

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	15653	15677
Channel Y	15956	15909
Channel Z	16453	16956

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	0.55	-1.14	1.75	0.57
Channel Y	-1.31	-3.09	0.00	0.54
Channel Z	-1.26	-2.81	0.25	0.52

6. Input Offset Current

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

7. Input Resistance

	Zeroing (MOhm)	Measuring (MOhm)
Channel X	0.2001	197.2
Channel Y	0.2002	198.6
Channel Z	0.1999	198.7

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

Schmid & Partner Engineering AG

s p e a g

Zeughausstrasse 43, 8004 Zurich, Switzerland
Phone +41 44 245 9700, Fax +41 44 245 9779
info@speag.com, http://www.speag.com

IMPORTANT NOTICE

USAGE OF THE DAE 3

The DAE unit is a delicate, high precision instrument and requires careful treatment by the user. There are no serviceable parts inside the DAE. Special attention shall be given to the following points:

Battery Exchange: The battery cover of the DAE3 unit is connected to a fragile 3-pin battery connector. Customer is responsible to apply utmost caution not to bend or damage the connector when changing batteries.

Shipping of the DAE: Before shipping the DAE to SPEAG for calibration Customer shall remove the batteries and pack the DAE in an antistatic bag. The packaging shall protect the DAE from impacts during transportation. The package shall be marked to indicate that a fragile instrument is inside.

E-Stop Failures: Touch detection may be malfunctioning due to broken magnets in the E-stop. Rough handling of the E-stop may lead to damage of these magnets. Touch and collision errors are often caused by dust and dirt accumulated in the E-stop. To prevent E-stop failure, Customer shall always mount the probe to the DAE carefully and keep the DAE unit in a non-dusty environment if not used for measurements.

Repair: Minor repairs are performed at no extra cost during the annual calibration. However, SPEAG reserves the right to charge for any repair especially if rough unprofessional handling caused the defect.

Important Note:

Warranty and calibration is void if the DAE unit is disassembled partly or fully by the Customer.

Important Note:

Never attempt to grease or oil the E-stop assembly. Cleaning and readjusting of the E-stop assembly is allowed by certified SPEAG personnel only and is part of the annual calibration procedure.

Schmid & Partner Engineering

	Agilent Technologies	Agilent Technologies (M) Sdn Bhd (012767-W) Bayan Lepas Free Industrial Zone 11900 Penang Malaysia		5962-0476
--	-----------------------------	---	--	-----------

Certificate Of Calibration

Certificate No: E5515CMY47510396

Manufacturer: Agilent Technologies

Model No: E5515C

Options Installed With Specifications: 002 003 H08

Description: WIRELESS COM.TST.SET

Serial No: MY47510396

Date of Calibration: 03-APR-2008

Temperature: (24 +/- 4)°C

Procedure: ATM-15-C0000

Humidity: 20% - 80% RH

This certifies that the above product was calibrated in compliance with a quality system registered to ISO 9001:2000, using applicable Agilent Technologies' procedures.

As Received: Factory tested - No incoming data available.

As Shipped Conditions: At the completion of the calibration, measured values were IN-SPECIFICATION at the points tested.

These calibration procedures and test points are those recommended in a procedure developed by Agilent.

Remarks or special requirements:

Traceability Information: Traceability is to national standards administered by the U. S. NIST, NRC Canada, Euromet members (NPL, PTB, BNM, etc.) or other recognized standards laboratories. Some measurements are traceable to natural physical constants, consensus standards or ratio type measurements. Supporting documentation relative to traceability is available for review by appointment. This report shall not be reproduced, except in full, without prior written approval of the calibration facility.

Calibration Equipment Used:



Model Number	Model Description	Trace Number	Date Used	Cal Due Date
11715A	AM/FM TEST SOURCE	PA2481	03-APR-2008	18-DEC-2008
11715A	AM/FM TEST SOURCE	PA2485	03-APR-2008	18-DEC-2008
3458A	8-1/2 DIGIT MULTIMETER	PA2343	03-APR-2008	25-JUL-2008
3458A	8-1/2 DIGIT MULTIMETER	PA2484	03-APR-2008	18-DEC-2008
35W1000	AMPLIFIER	PA2390	03-APR-2008	10-SEP-2008
54602B	OSCILLOSCOPE	PA2479	03-APR-2008	18-DEC-2008
8481D	POWER SENSOR	PA2382	03-APR-2008	10-SEP-2008
8481D	POWER SENSOR	PA2494	03-APR-2008	17-JAN-2009

Date Used: Date equipment used in this Calibration.

Print Date: 04-APR-2008

Tay Eng Su
Quality Manager



 Agilent Technologies	Agilent Technologies (M) Sdn Bhd (012767-W) Bayan Lepas Free Industrial Zone 11900 Penang Malaysia	 5962-0476
---	---	--

Certificate Of Calibration

Certificate No: E5515CMY47510396

Calibration Equipment Used:

Model Number	Model Description	Trace Number	Date Used	Cal Due Date
8482A	POWER SENSOR	PA2125	03-APR-2008	08-APR-2008
8482A	POWER SENSOR	PA2357	03-APR-2008	30-SEP-2008
8482A	POWER SENSOR	PA2495	03-APR-2008	16-JAN-2009
8563E	SPECTRUM ANALYZER	PA2021	03-APR-2008	11-OCT-2008
8663A	SYNTHESIZED SIGNAL GENERATOR	PA2486	03-APR-2008	18-DEC-2008
8665B	SYNTHESIZED SIGNAL GENERATOR	PA2134	03-APR-2008	30-JUL-2008
8901A	MODULATION ANALYZER	PA2487	03-APR-2008	22-OCT-2008
8903B	AUDIO ANALYZER	PA2346	03-APR-2008	23-JUL-2008
8903B	AUDIO ANALYZER	PA2488	03-APR-2008	06-NOV-2008
8904A	MULTIFUNCTION SYNTHESIZER	PA2340	03-APR-2008	23-JUL-2008
8904A	MULTIFUNCTION SYNTHESIZER	PA2480	03-APR-2008	18-DEC-2008
89441A	VECTOR SIGNAL ANALYZER	PA2087	03-APR-2008	15-JAN-2009
E4419B	EPM SERIES POWER METER	PA2056	03-APR-2008	17-AUG-2008
E4419B	EPM SERIES POWER METER	PA2371	03-APR-2008	10-SEP-2008
E4419B	EPM SERIES POWER METER	PA2496	03-APR-2008	16-JAN-2009
E4437B	SIGNAL GENERATOR	PA2077	03-APR-2008	22-DEC-2008
E4437B	SIGNAL GENERATOR	PA2082	03-APR-2008	05-NOV-2008
E4437B	SIGNAL GENERATOR	PA2369	03-APR-2008	31-JUL-2008
E4438C	SIGNAL GENERATOR	PA2078	03-APR-2008	06-NOV-2008
E4440A	SPECTRUM ANALYZER	PA2501	03-APR-2008	17-JAN-2009
ET30897	REF SOURCE 0DBM	PA2500	03-APR-2008	27-AUG-2008
GRF5008	RF POWER AMP 2-4GHZ	PA2368	03-APR-2008	10-SEP-2008
GRF5022	RF POWER AMP 1-2GHZ	PA2375	03-APR-2008	10-SEP-2008
PS-400	AUDIO POWER AMPLIFIER	PA2389	03-APR-2008	23-JUL-2008

 <p>Agilent Technologies</p> <p>AGILENT TECHNOLOGIES INTERNAL ASSESSMENT PROGRAM - EMG E102/1995</p>	<p>U.S. EPSG Service Centers Irvine Branch 17811 Sky Park Circle BLDG9 SuiteFG Irvine, CA 92614 (800) 829-4444</p>
--	--

Certificate of Calibration
Agilent Calibration
Certificate Number: 1-1332469872-1

Manufacturer:	Hewlett-Packard Co.	Description:	RF Network Analyzer, 3 GHz
Model Number:	8714C	Options Installed:	
Serial Number:	US38171129	Customer Asset No:	K82012
Customer:	Qualcomm Inc 9393 Waples St Ste 150 Receiving SAN DIEGO CA 92121-3907 UNITED STATES	Location of Calibration:	U.S. EPSG Service Centers Irvine Branch 17811 Sky Park Circle BLDG9 SuiteFG Irvine, CA 92614 (800) 829-4444
Procedure:	STE-50112873-A.05.02A	Customer PO Number	FITO CISNEROS-CC
Date of Calibration:	1 Jul 2008	Humidity:	(50 +/- 30)% RH
Temperature:	(23 +/- 5) °C		

This certifies that the above product was calibrated in compliance with a quality system registered to ISO 9001:2000 using applicable Agilent Technologies procedures.

As Received Conditions:

Initial testing found the equipment to be **IN-SPECIFICATION** at the points tested.

As Shipped Conditions:

At the completion of the calibration, measured values were **IN-SPECIFICATION** at the points tested.

Remarks or Special Requirements:


Our calibration procedures are designed to provide measurement uncertainty of less than or equal to one quarter of the specification of the unit under test, where possible, with a coverage factor of 2.


The test limits stated in the report correspond to the published specifications of the equipment, at the points tested.

This certificate is composed of 2 pages containing a summary of calibration information.

Based on the recommended calibration interval, the next calibration is due on 1 Jul 2009.

Print Date: 1 Jul 2008


Rick Whitcomb Americas Delivery Mgr.

 Agilent Technologies <small>AGILENT TECHNOLOGIES INTERNAL ASSESSMENT PROGRAM - EMG E102/1995</small>	U.S. EPSG Service Centers Irvine Branch 17811 Sky Park Circle BLDG9 SuiteFG Irvine, CA 92614 (800) 829-4444
--	--

Certificate of Calibration
Agilent Calibration
Certificate Number: 1-1332469872-1

Traceability Information:

Technician ID Number: 571473

Traceability is to national standards administered by the U.S. NIST, NRC Canada, Euromet members (NPL, PTB, BNM, etc.) or other recognized standards laboratories.

Some measurements are traceable to natural physical constants, consensus standards or ratio type measurements.

Supporting documentation relative to traceability is available for review by appointment.

This certificate shall not be reproduced, except in full, without prior written approval of the laboratory.

Calibration Equipment Used:

Model Number:	Model Description:	Trace Number:	Cal Due Date:	Certificate Number:
33250A	FUNCTION/ARB WAVEFORM GENERATO	33250A13208	13 Feb 2009	1-1209345471-9
8491B	Coaxial Attenuator, dc-18 GHz, Type N	8491B22687	12 Oct 2008	1-1116360923-1
85032B	50-ohm Type N Calibration Kit	85032B00590	15 May 2009	1-1296338903-1
8491B	Coaxial Attenuator, dc-18 GHz, Type N	8491B20469	12 Oct 2008	1-1116393221-1
8491B	Coaxial Attenuator, dc-18 GHz, Type N	8491B21967	12 Oct 2008	1-1116280674-1
11667A	DC-18 GHz power splitter, Type N, 50 ohm	11667A14796	28 Aug 2008	1-736835579-1
8491B	Coaxial Attenuator, dc-18 GHz, Type N	8491B28495	12 Oct 2008	1-1116280193-1
5343A	Microwave Frequency Counter	5343A01869	14 May 2009	1-1284667857-16
438A	Dual-channel power meter with GPIB	438A05992	13 Aug 2008	1-735025904-17
8482A	Power sensor, 100 kHz to 4.2 GHz	8482A15126	22 Aug 2008	1-742109126-1
8496G	0-110dB Prog. Step Attenuator, 0-4GHz	8496G40661	15 May 2009	1-1296374720-1
E4448A	PSA Spectrum Analyzer 3 Hz - 50 GHz	E4448A00183	28 Aug 2008	1-742887744-1

Measurement Report

AGILENT TECHNOLOGIES
17811 Sky Park Circle
Building 9, Suite FG
Irvine, CA 92614

Report Number: 1-1332469872-1 **Customer:** QUALCOMM INC
Manufacturer: Hewlett-Packard Co.
(Agilent Technologies) **Cust. Unit No.:** K82012
Model Number: 8714C (HP8714C) **Serial Number:** US38171129
Options Installed: none
Firmware Version:

Test Date: 1 Jul 2008 **Tested By:** 571473
Temperature: 23±5 °C **Humidity:** 5 to 80% RH

Test Program Name: HP871X Part No. 5011-2873
Test Program Version: A.05.02A
Test Executive: STE/9000 C.08.21 (MENDOR B.06.13A)

Specification Limits:

Unless indicated otherwise, the units for minimum and/or maximum specification limits are the same as the units stated for the measured value.

Calibration Standards Used

<u>Model No.</u>	<u>Serial No.</u>	<u>Trace No.</u>	<u>Cal Due Date</u>
AGT8496G	MY42140661	8496G40661	15 May 2009
AGTE4448A	MY45300183	E4448A00183	28 Aug 2008
HP11667A	14796	11667A14796	28 Aug 2008
HP33250A	MY40013208	33250A13208	13 Feb 2009
HP438A	2822A05992	438A05992	13 Aug 2008
HP5343A	2438A01869	5343A01869	14 May 2009
HP8482A	2652A15126	8482A15126	22 Aug 2008
HP8491B	028495	8491B28495	12 Oct 2008
HP8491B	20469	8491B20469	12 Oct 2008
HP8491B	21967	8491B21967	12 Oct 2008
HP8491B	22687	8491B22687	12 Oct 2008
HP85032B	2541A00590	85032B00590	15 May 2009

Measurement Report

Report Number: 1-1332469872-1	Test Date: 1 Jul 2008
Model Number: HP8714C	Cust. Unit No.: K82012
Serial Number: US38171129	

FREQUENCY ACCURACY

PASSED

<u>TEST CONDITIONS</u>	<u>MINIMUM</u>	<u>MEASURED</u>	<u>MAXIMUM</u>
Frequency Error at			
10.000000 MHz	-0.050	-0.007 kHz	0.050
50.000000 MHz	-0.250	-0.034 kHz	0.250
123.456789 MHz	-0.617	-0.086 kHz	0.617
500.000000 MHz	-2.500	-0.349 kHz	2.500
1000.000000 MHz	-5.000	-0.698 kHz	5.000
1300.000000 MHz	-6.500	-0.908 kHz	6.500
1905.000000 MHz	-9.525	-1.332 kHz	9.525
1915.000000 MHz	-9.575	-1.339 kHz	9.575
2500.000000 MHz	-12.500	-1.747 kHz	12.500
2850.000000 MHz	-14.250	-1.992 kHz	14.250

GAIN COMPRESSION

PASSED

<u>TEST CONDITIONS</u>	<u>MEASURED</u>	<u>MAXIMUM</u>
0.3 MHz	0.144 dB	0.367
1.0 MHz	0.000 dB	0.367
10.0 MHz	0.000 dB	0.367
100.0 MHz	0.000 dB	0.367
500.0 MHz	0.000 dB	0.367
1000.0 MHz	0.000 dB	0.367
2000.0 MHz	0.000 dB	0.367
3000.0 MHz	0.013 dB	0.367

NOISE FLOOR

PASSED

<u>TEST CONDITIONS</u>	<u>MEASURED</u>	<u>MAXIMUM</u>
Narrowband Detector Mode		
Fine BW, Spur Avoid ON		
300 kHz - 5 MHz	-108.8 dBm	-50.0
5 MHz - 3000 MHz	-97.4 dBm	-90.0

Broadband Detector Mode
 Narrow BW, Spur Avoid OFF

continued...

Measurement Report

Report Number: 1-1332469872-1	Test Date: 1 Jul 2008
Model Number: HP8714C	
Serial Number: US38171129	Cust. Unit No.: K82012

ABSOLUTE ACCURACY

PASSED

<u>TEST CONDITIONS</u>	<u>MINIMUM</u>	<u>MEASURED</u>	<u>MAXIMUM</u>
+16.0 dBm	-0.55	0.13 dB	0.55
+10.0 dBm	-0.50	0.10 dB	0.50
+5.0 dBm	-0.50	0.16 dB	0.50
0.0 dBm	-0.50	0.15 dB	0.50
-5.0 dBm	-0.50	0.11 dB	0.50
-10.0 dBm	-0.50	0.12 dB	0.50
-15.0 dBm	-0.50	0.13 dB	0.50
-20.0 dBm	-0.50	0.13 dB	0.50
-25.0 dBm	-0.50	0.14 dB	0.50
-30.0 dBm	-0.50	0.14 dB	0.50
-35.0 dBm	-0.75	0.38 dB	0.75
-40.0 dBm	-1.00	0.43 dB	1.00
-45.0 dBm	-1.50	0.63 dB	1.50
-50.0 dBm	-2.00	0.65 dB	2.00
-55.0 dBm	-7.00	2.02 dB	7.00

BROADBAND FREQUENCY RESPONSE

PASSED

<u>TEST CONDITIONS</u>	<u>MEASURED</u>	<u>MAXIMUM</u>
Nominal Input Level -6 dBm	1.02 dB	2.00

DIRECTIVITY

PASSED

<u>TEST CONDITIONS</u>	<u>MEASURED</u>	<u>MAXIMUM</u>
Directivity	-42.5 dB	-30.0
Source Match	-45.7 dB	-20.0
Input Match	-21.3 dB	-18.0



Report # 14352:1190361639

Certificate of Calibration

5775 Morehouse Drive, San Diego, CA 92121-2779

Manufacturer: GIGATRONICS

Model #: 8542C

Asset #: K82228

Serial Number: 1834430

Description: POWER METER

QUALCOMM Incorporated hereby certifies that...

the above described instrument met or exceeded all published specifications at the time of calibration specified below; and has been calibrated using standards whose accuracies are traceable to the National Institute of Standards and Technology (NIST) within the limitations of the Institute's calibration services, or have been derived from accepted values or physical constants, or have been derived by ratio or self calibration techniques. The collective uncertainty of the measurement standards have not exceeded 4:1 test accuracy ratio for each characteristic calibrated, unless otherwise noted. All calibration activities performed are in compliance with MIL-STD-45662A, ANSI/NCSS Z540-1-1994, ISO-9001-1994, and ISO 10012-1:1992. This report and its results refer only to the item(s) calibrated and are not to be reproduced, except in full, without the written approval of the Qualcomm Incorporated Calibration Laboratory.

CALIBRATION INFORMATION

Cal Date	09/21/2007	Interval	12	Cal Temp	22
Cal Due	09/21/2008	Data	YES	Humidity	53
Tech	Troy Howard	Pass	YES	Seals OK	YES
Condition Received	IN TOLERANCE				
Condition Returned	MEETS MFR'S SPECS				
Physical Condition of Equipment	GOOD				
Out of Tolerance Conditions/Limitation					

Cal Procedure Gigatronics 8540C Series Power Meters



Revision QUAL- 031125 REV 1.1

STANDARDS USED FOR CALIBRATION

Asset Number	MFG	Model	Description	Cal Date	Due Date
X03045	AGILENT TECHNOLOGIES	34401A	MULTIMETER	05/10/07	11/09/07
X11013	AGILENT TECHNOLOGIES	3335A	SYNTHESIZER/LEVEL GENERATOR	07/26/07	07/25/08
X21296	GIGATRONICS	80301A	POWER SENSOR	10/24/06	10/24/07
K65267	AGILENT TECHNOLOGIES	432A	POWER METER	11/22/06	11/22/07
X10665	AGILENT TECHNOLOGIES	478A	THERMISTOR MOUNT	11/08/06	11/08/07

Signed: *[Signature]*

Date: 09/21/2007


 Agilent Technologies	Agilent Technologies (M) Sdn Bhd (012767-W) Bayan Lepas Free Industrial Zone 11900 Penang Malaysia	 5962-0476
---	---	--

Certificate Of Calibration

Certificate No: E5515CMY47510396

Calibration Equipment Used:

Model Number	Model Description	Trace Number	Date Used	Cal Due Date
8482A	POWER SENSOR	PA2125	03-APR-2008	08-APR-2008
8482A	POWER SENSOR	PA2357	03-APR-2008	30-SEP-2008
8482A	POWER SENSOR	PA2495	03-APR-2008	16-JAN-2009
8563E	SPECTRUM ANALYZER	PA2021	03-APR-2008	11-OCT-2008
8663A	SYNTHESIZED SIGNAL GENERATOR	PA2486	03-APR-2008	18-DEC-2008
8665B	SYNTHESIZED SIGNAL GENERATOR	PA2134	03-APR-2008	30-JUL-2008
8901A	MODULATION ANALYZER	PA2487	03-APR-2008	22-OCT-2008
8903B	AUDIO ANALYZER	PA2346	03-APR-2008	23-JUL-2008
8903B	AUDIO ANALYZER	PA2488	03-APR-2008	06-NOV-2008
8904A	MULTIFUNCTION SYNTHESIZER	PA2340	03-APR-2008	23-JUL-2008
8904A	MULTIFUNCTION SYNTHESIZER	PA2480	03-APR-2008	18-DEC-2008
89441A	VECTOR SIGNAL ANALYZER	PA2087	03-APR-2008	15-JAN-2009
E4419B	EPM SERIES POWER METER	PA2056	03-APR-2008	17-AUG-2008
E4419B	EPM SERIES POWER METER	PA2371	03-APR-2008	10-SEP-2008
E4419B	EPM SERIES POWER METER	PA2496	03-APR-2008	16-JAN-2009
E4437B	SIGNAL GENERATOR	PA2077	03-APR-2008	22-DEC-2008
E4437B	SIGNAL GENERATOR	PA2082	03-APR-2008	05-NOV-2008
E4437B	SIGNAL GENERATOR	PA2369	03-APR-2008	31-JUL-2008
E4438C	SIGNAL GENERATOR	PA2078	03-APR-2008	06-NOV-2008
E4440A	SPECTRUM ANALYZER	PA2501	03-APR-2008	17-JAN-2009
ET30897	REF SOURCE 0DBM	PA2500	03-APR-2008	27-AUG-2008
GRF5008	RF POWER AMP 2-4GHZ	PA2368	03-APR-2008	10-SEP-2008
GRF5022	RF POWER AMP 1-2GHZ	PA2375	03-APR-2008	10-SEP-2008
PS-400	AUDIO POWER AMPLIFIER	PA2389	03-APR-2008	23-JUL-2008

 <p>Agilent Technologies</p> <p>AGILENT TECHNOLOGIES INTERNAL ASSESSMENT PROGRAM - EMG E102/1995</p>	<p>U.S. EPSG Service Centers Irvine Branch 17811 Sky Park Circle BLDG9 SuiteFG Irvine, CA 92614 (800) 829-4444</p>
--	--

Certificate of Calibration
Agilent Calibration
Certificate Number: 1-1332469872-1

Manufacturer:	Hewlett-Packard Co.	Description:	RF Network Analyzer, 3 GHz
Model Number:	8714C	Options Installed:	
Serial Number:	US38171129	Customer Asset No:	K82012
Customer:	Qualcomm Inc 9393 Waples St Ste 150 Receiving SAN DIEGO CA 92121-3907 UNITED STATES	Location of Calibration:	U.S. EPSG Service Centers Irvine Branch 17811 Sky Park Circle BLDG9 SuiteFG Irvine, CA 92614 (800) 829-4444
Procedure:	STE-50112873-A.05.02A	Customer PO Number	FITO CISNEROS-CC
Date of Calibration:	1 Jul 2008	Humidity:	(50 +/- 30)% RH
Temperature:	(23 +/- 5) °C		

This certifies that the above product was calibrated in compliance with a quality system registered to ISO 9001:2000 using applicable Agilent Technologies procedures.

As Received Conditions:

Initial testing found the equipment to be **IN-SPECIFICATION** at the points tested.

As Shipped Conditions:

At the completion of the calibration, measured values were **IN-SPECIFICATION** at the points tested.

Remarks or Special Requirements:


Our calibration procedures are designed to provide measurement uncertainty of less than or equal to one quarter of the specification of the unit under test, where possible, with a coverage factor of 2.


The test limits stated in the report correspond to the published specifications of the equipment, at the points tested.

This certificate is composed of 2 pages containing a summary of calibration information.

Based on the recommended calibration interval, the next calibration is due on 1 Jul 2009.

Print Date: 1 Jul 2008


Rick Whitcomb Americas Delivery Mgr.

 <p>Agilent Technologies</p> <p>AGILENT TECHNOLOGIES INTERNAL ASSESSMENT PROGRAM - EMG E102/1995</p>	<p>U.S. EPSG Service Centers</p> <p>Irvine Branch</p> <p>17811 Sky Park Circle BLDG9 SuiteFG</p> <p>Irvine, CA 92614 (800) 829-4444</p>
---	---

Certificate of Calibration

Agilent Calibration

Certificate Number: 1-1332469872-1

Traceability Information:

Technician ID Number: 571473

Traceability is to national standards administered by the U.S. NIST, NRC Canada, Euromet members (NPL, PTB, BNM, etc.) or other recognized standards laboratories.

Some measurements are traceable to natural physical constants, consensus standards or ratio type measurements.

Supporting documentation relative to traceability is available for review by appointment.

This certificate shall not be reproduced, except in full, without prior written approval of the laboratory.

Calibration Equipment Used:

Model Number:	Model Description:	Trace Number:	Cal Due Date:	Certificate Number:
33250A	FUNCTION/ARB WAVEFORM GENERATO	33250A13208	13 Feb 2009	1-1209345471-9
8491B	Coaxial Attenuator, dc-18 GHz, Type N	8491B22687	12 Oct 2008	1-1116360923-1
85032B	50-ohm Type N Calibration Kit	85032B00590	15 May 2009	1-1296338903-1
8491B	Coaxial Attenuator, dc-18 GHz, Type N	8491B20469	12 Oct 2008	1-1116393221-1
8491B	Coaxial Attenuator, dc-18 GHz, Type N	8491B21967	12 Oct 2008	1-1116280674-1
11667A	DC-18 GHz power splitter, Type N, 50 ohm	11667A14796	28 Aug 2008	1-736835579-1
8491B	Coaxial Attenuator, dc-18 GHz, Type N	8491B28495	12 Oct 2008	1-1116280193-1
5343A	Microwave Frequency Counter	5343A01869	14 May 2009	1-1284667857-16
438A	Dual-channel power meter with GPIB	438A05992	13 Aug 2008	1-735025904-17
8482A	Power sensor, 100 kHz to 4.2 GHz	8482A15126	22 Aug 2008	1-742109126-1
8496G	0-110dB Prog. Step Attenuator, 0-4GHz	8496G40661	15 May 2009	1-1296374720-1
E4448A	PSA Spectrum Analyzer 3 Hz - 50 GHz	E4448A00183	28 Aug 2008	1-742887744-1

Measurement Report

AGILENT TECHNOLOGIES
17811 Sky Park Circle
Building 9, Suite FG
Irvine, CA 92614

Report Number: 1-1332469872-1 **Customer:** QUALCOMM INC
Manufacturer: Hewlett-Packard Co.
(Agilent Technologies) **Cust. Unit No.:** K82012
Model Number: 8714C (HP8714C) **Serial Number:** US38171129
Options Installed: none
Firmware Version:

Test Date: 1 Jul 2008 **Tested By:** 571473
Temperature: 23±5 °C **Humidity:** 5 to 80% RH

Test Program Name: HP871X Part No. 5011-2873
Test Program Version: A.05.02A
Test Executive: STE/9000 C.08.21 (MENDOR B.06.13A)

Specification Limits:

Unless indicated otherwise, the units for minimum and/or maximum specification limits are the same as the units stated for the measured value.

Calibration Standards Used

<u>Model No.</u>	<u>Serial No.</u>	<u>Trace No.</u>	<u>Cal Due Date</u>
AGT8496G	MY42140661	8496G40661	15 May 2009
AGTE4448A	MY45300183	E4448A00183	28 Aug 2008
HP11667A	14796	11667A14796	28 Aug 2008
HP33250A	MY40013208	33250A13208	13 Feb 2009
HP438A	2822A05992	438A05992	13 Aug 2008
HP5343A	2438A01869	5343A01869	14 May 2009
HP8482A	2652A15126	8482A15126	22 Aug 2008
HP8491B	028495	8491B28495	12 Oct 2008
HP8491B	20469	8491B20469	12 Oct 2008
HP8491B	21967	8491B21967	12 Oct 2008
HP8491B	22687	8491B22687	12 Oct 2008
HP85032B	2541A00590	85032B00590	15 May 2009

Measurement Report

Report Number: 1-1332469872-1	Test Date: 1 Jul 2008
Model Number: HP8714C	Cust. Unit No.: K82012
Serial Number: US38171129	

FREQUENCY ACCURACY

PASSED

<u>TEST CONDITIONS</u>	<u>MINIMUM</u>	<u>MEASURED</u>	<u>MAXIMUM</u>
Frequency Error at			
10.000000 MHz	-0.050	-0.007 kHz	0.050
50.000000 MHz	-0.250	-0.034 kHz	0.250
123.456789 MHz	-0.617	-0.086 kHz	0.617
500.000000 MHz	-2.500	-0.349 kHz	2.500
1000.000000 MHz	-5.000	-0.698 kHz	5.000
1300.000000 MHz	-6.500	-0.908 kHz	6.500
1905.000000 MHz	-9.525	-1.332 kHz	9.525
1915.000000 MHz	-9.575	-1.339 kHz	9.575
2500.000000 MHz	-12.500	-1.747 kHz	12.500
2850.000000 MHz	-14.250	-1.992 kHz	14.250

GAIN COMPRESSION

PASSED

<u>TEST CONDITIONS</u>	<u>MEASURED</u>	<u>MAXIMUM</u>
0.3 MHz	0.144 dB	0.367
1.0 MHz	0.000 dB	0.367
10.0 MHz	0.000 dB	0.367
100.0 MHz	0.000 dB	0.367
500.0 MHz	0.000 dB	0.367
1000.0 MHz	0.000 dB	0.367
2000.0 MHz	0.000 dB	0.367
3000.0 MHz	0.013 dB	0.367

NOISE FLOOR

PASSED

<u>TEST CONDITIONS</u>	<u>MEASURED</u>	<u>MAXIMUM</u>
Narrowband Detector Mode		
Fine BW, Spur Avoid ON		
300 kHz - 5 MHz	-108.8 dBm	-50.0
5 MHz - 3000 MHz	-97.4 dBm	-90.0

Broadband Detector Mode
 Narrow BW, Spur Avoid OFF

continued...

Measurement Report

Report Number: 1-1332469872-1	Test Date: 1 Jul 2008
Model Number: HP8714C	
Serial Number: US38171129	Cust. Unit No.: K82012

ABSOLUTE ACCURACY

PASSED

<u>TEST CONDITIONS</u>	<u>MINIMUM</u>	<u>MEASURED</u>	<u>MAXIMUM</u>
+16.0 dBm	-0.55	0.13 dB	0.55
+10.0 dBm	-0.50	0.10 dB	0.50
+5.0 dBm	-0.50	0.16 dB	0.50
0.0 dBm	-0.50	0.15 dB	0.50
-5.0 dBm	-0.50	0.11 dB	0.50
-10.0 dBm	-0.50	0.12 dB	0.50
-15.0 dBm	-0.50	0.13 dB	0.50
-20.0 dBm	-0.50	0.13 dB	0.50
-25.0 dBm	-0.50	0.14 dB	0.50
-30.0 dBm	-0.50	0.14 dB	0.50
-35.0 dBm	-0.75	0.38 dB	0.75
-40.0 dBm	-1.00	0.43 dB	1.00
-45.0 dBm	-1.50	0.63 dB	1.50
-50.0 dBm	-2.00	0.65 dB	2.00
-55.0 dBm	-7.00	2.02 dB	7.00

BROADBAND FREQUENCY RESPONSE

PASSED

<u>TEST CONDITIONS</u>	<u>MEASURED</u>	<u>MAXIMUM</u>
Nominal Input Level -6 dBm	1.02 dB	2.00

DIRECTIVITY

PASSED

<u>TEST CONDITIONS</u>	<u>MEASURED</u>	<u>MAXIMUM</u>
Directivity	-42.5 dB	-30.0
Source Match	-45.7 dB	-20.0
Input Match	-21.3 dB	-18.0