Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2020.7.20

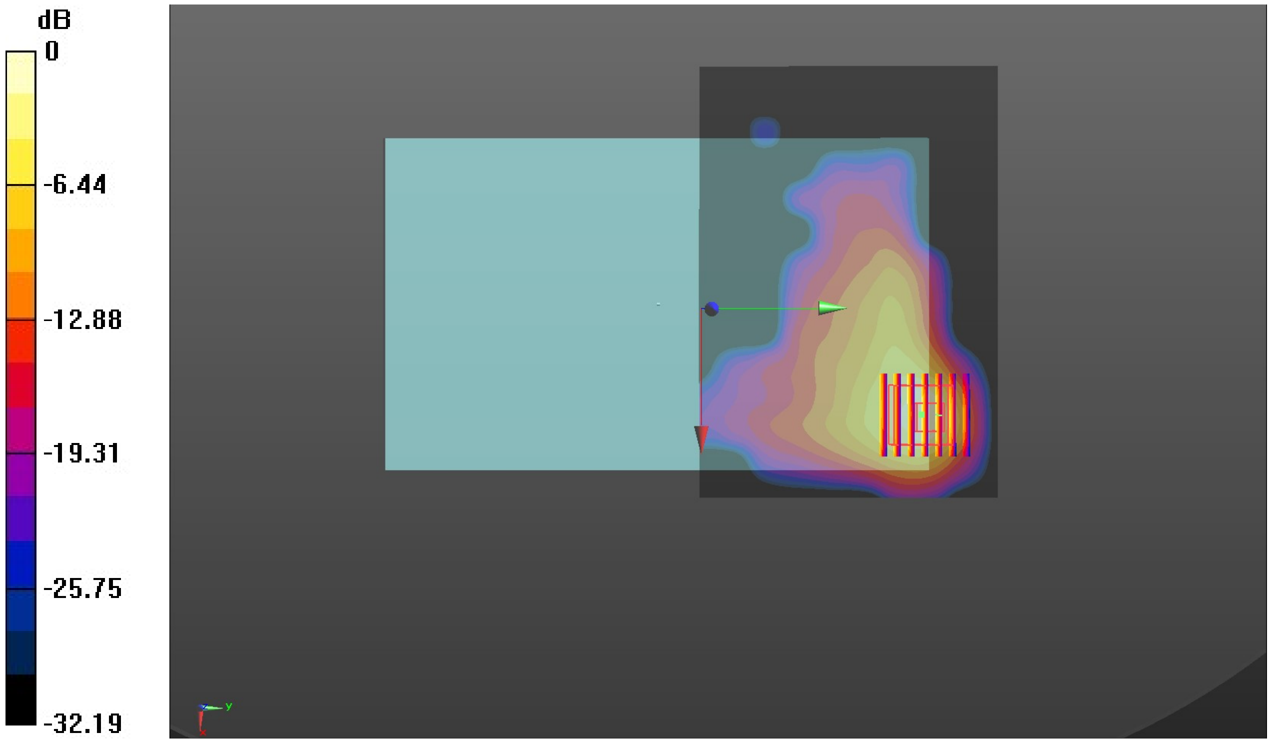
08_Bluetooth_DH5 1Mbps_Bottom Face_0mm_Ch39

Communication System: UID 0, Bluetooth (0); Frequency: 2441 MHz;Duty Cycle: 1:1.299
Medium: HSL_2450 Medium parameters used: f = 2441 MHz; σ = 1.77 S/m; ε_r = 40.65; ρ = 1000 kg/m^3
Ambient Temperature：23.3 °C; Liquid Temperature：22.8 °C

DASY5 Configuration:
- Probe: EX3DV4 - SN3843; ConvF(7.06, 7.06, 7.06); Calibrated: 2019.9.26
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn799; Calibrated: 2020.2.10
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1201
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Area Scan (131x91x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 1.35 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 0.2380 V/m; Power Drift = 0.09 dB
Peak SAR (extrapolated) = 1.61 W/kg
SAR(1 g) = 0.563 W/kg; SAR(10 g) = 0.226 W/kg
Maximum value of SAR (measured) = 1.09 W/kg



0 dB = 1.09 W/kg = 0.37 dBW/kg

Appendix C. DASY Calibration Certificate

The DASY calibration certificates are shown as follows.

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CALIBRATION LABORATORY

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CNAS L0570

Client **Sporton** **Certificate No: Z18-60533**

CALIBRATION CERTIFICATE

Object	D835V2 - SN: 4d162
Calibration Procedure(s)	FF-Z11-003-01 Calibration Procedures for dipole validation kits
Calibration date:	December 5, 2018

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)℃ and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRVD	102196	07-Mar-18 (CTTL, No.J18X01510)	Mar-19
Power sensor NRV-Z5	100596	07-Mar-18 (CTTL, No.J18X01510)	Mar-19
Reference Probe EX3DV4	SN 7514	27-Aug-18(SPEAG,No.EX3-7514_Aug18)	Aug-19
DAE4	SN 1555	20-Aug-18(SPEAG,No.DAE4-1555_Aug18)	Aug-19
Secondary Standards	**ID #**	**Cal Date(Calibrated by, Certificate No.)**	**Scheduled Calibration**
Signal Generator E4438C	MY49071430	23-Jan-18 (CTTL, No.J18X00560)	Jan-19
NetworkAnalyzer E5071C	MY46110673	24-Jan-18 (CTTL, No.J18X00561)	Jan-19

	Name	Function	Signature
Calibrated by:	Zhao Jing	SAR Test Engineer	
Reviewed by:	Lin Hao	SAR Test Engineer	
Approved by:	Qi Dianyuan	SAR Project Leader	

Issued: December 8, 2018

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Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORMx,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Measurement procedure for assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices- Part 1: Device used next to the ear (Frequency range of 300MHz to 6GHz)", July 2016
c) IEC 62209-2, "Procedure to measure the Specific Absorption Rate (SAR) For wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz)", March 2010
d) KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

Additional Documentation:

e) DASY4/5 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.

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%.

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Measurement Conditions

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

DASY Version	DASY52	52.10.2.1495
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
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	42.7 ± 6 %	0.88 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.35 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**9.61 mW /g ± 18.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	1.56 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**6.35 mW /g ± 18.7 % (k=2)**

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	53.7 ± 6 %	0.99 mho/m ± 6 %
Body TSL temperature change during test	<1.0 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.47 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**9.70 mW /g ± 18.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	1.64 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**6.47 mW /g ± 18.7 % (k=2)**

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Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.6Ω- 2.56jΩ
Return Loss	- 28.9dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.2Ω- 6.92jΩ
Return Loss	- 22.3dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.306 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. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
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

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DASY5 Validation Report for Head TSL Date: 12.04.2018

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d162

Communication System: UID 0, CW; Frequency: 835 MHz; Duty Cycle: 1:1

Medium parameters used: f = 835 MHz; σ = 0.881 S/m; ε_r = 42.71; ρ = 1000 kg/m3

Phantom section: Right Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7514; ConvF(9.09, 9.09, 9.09) @ 835 MHz; Calibrated: 8/27/2018
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1555; Calibrated: 8/20/2018
- Phantom: MFP_V5.1C ; Type: QD 000 P51CA; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7450)

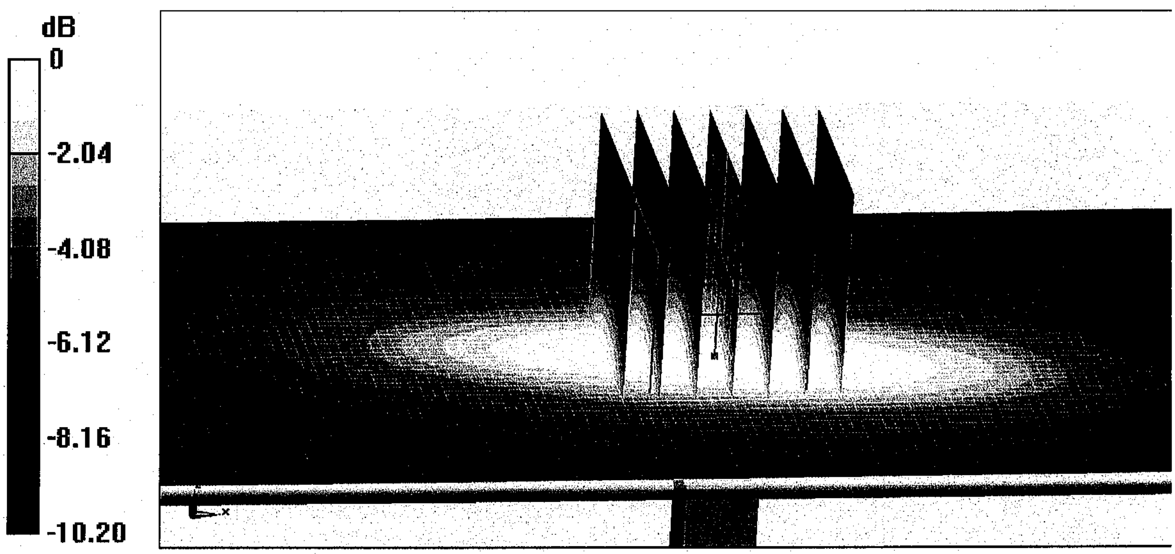
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 57.75 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 3.50 W/kg

SAR(1 g) = 2.35 W/kg; SAR(10 g) = 1.56 W/kg

Maximum value of SAR (measured) = 3.11 W/kg



0 dB = 3.11 W/kg = 4.93 dBW/kg

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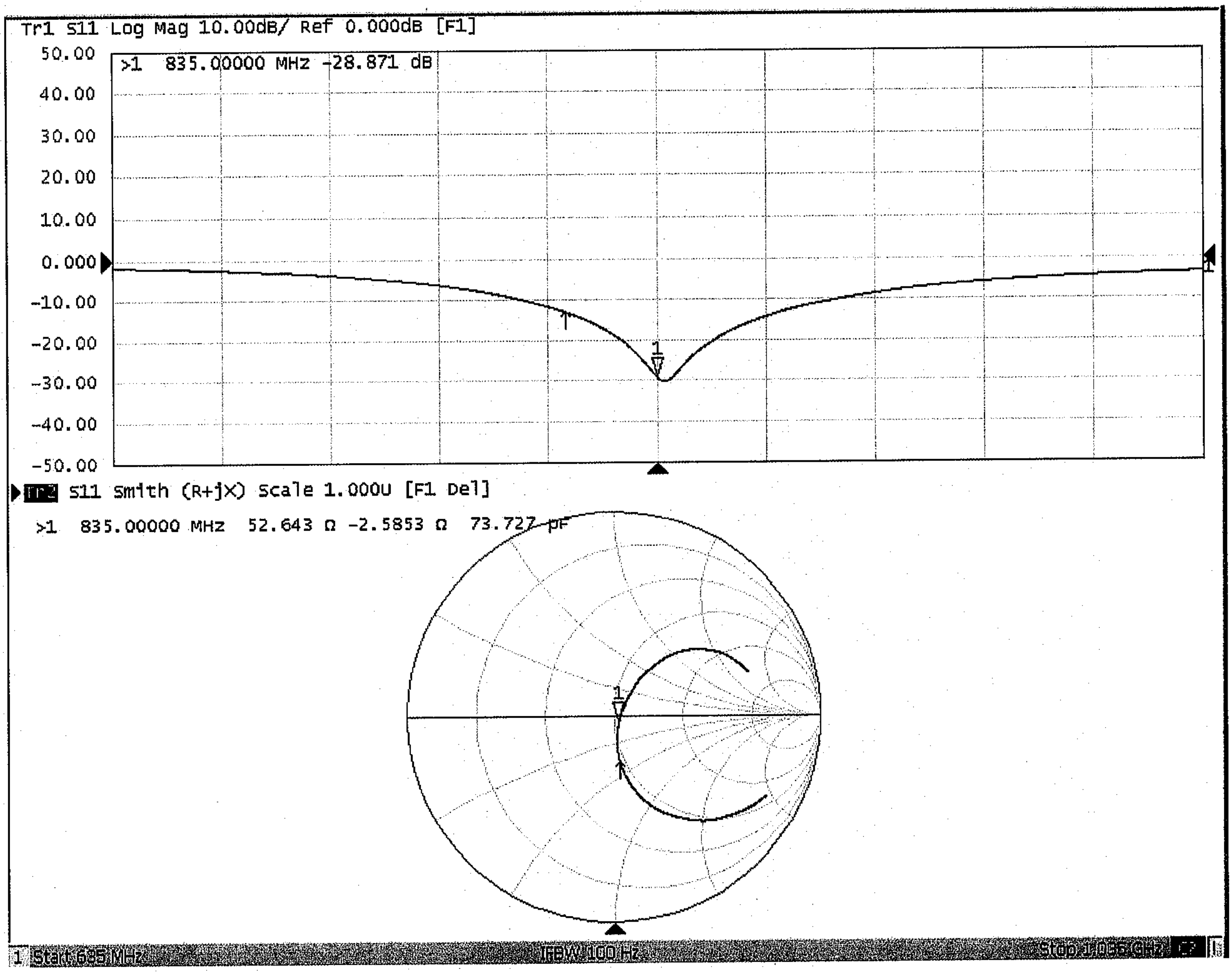
Impedance Measurement Plot for Head TSL



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DASY5 Validation Report for Body TSL Date: 12.04.2018

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d162

Communication System: UID 0, CW; Frequency: 835 MHz; Duty Cycle: 1:1

Medium parameters used: f = 835 MHz; σ = 0.986 S/m; ε_r = 53.72; ρ = 1000 kg/m3

Phantom section: Center Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7514; ConvF(9.47, 9.47, 9.47) @ 835 MHz; Calibrated: 8/27/2018
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1555; Calibrated: 8/20/2018
- Phantom: MFP_V5.1C ; Type: QD 000 P51CA; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7450)

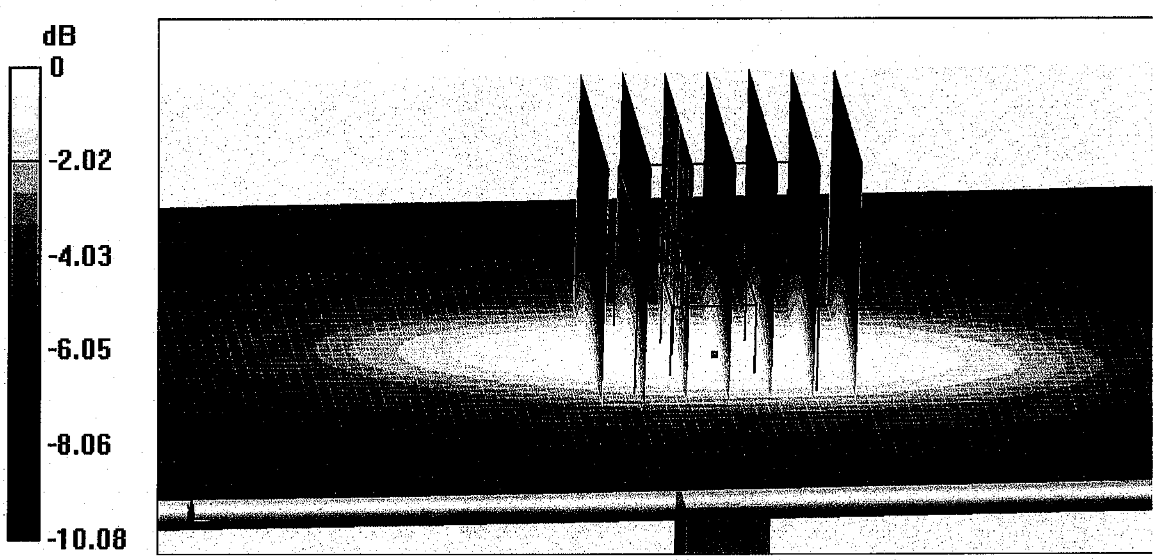
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 55.24 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 3.72 W/kg

SAR(1 g) = 2.47 W/kg; SAR(10 g) = 1.64 W/kg

Maximum value of SAR (measured) = 3.29 W/kg



0 dB = 3.29 W/kg = 5.17 dBW/kg

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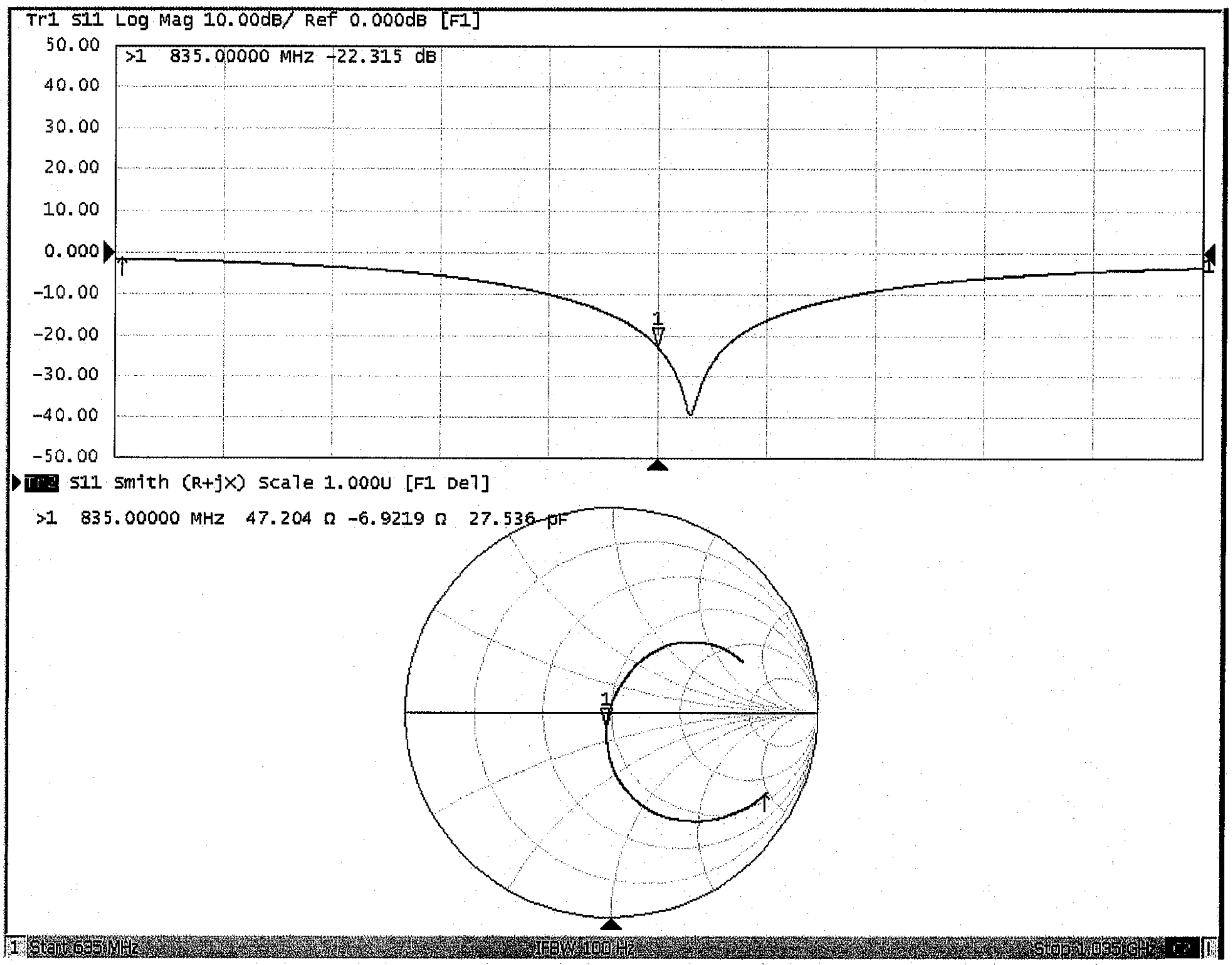
Impedance Measurement Plot for Body TSL



D835V2, Serial No. 4d162 Extended Dipole Calibrations

Referring to KDB 865664 D01 v01r02, if dipoles are verified in return loss (<-20dB, within 20% of prior calibration), and in impedance (within 5 ohm of prior calibration), the annual calibration is not necessary and the calibration interval can be extended.

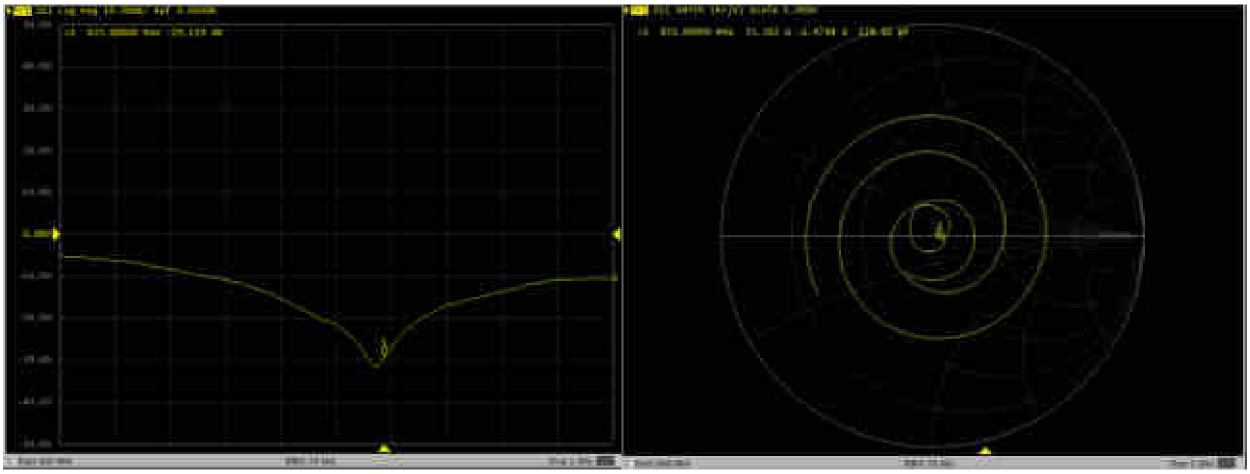
D835V2 – serial no. 4d162												
	835 Head						835 Body					
Date of Measurement	Return-Loss (dB)	Delta (%)	Real Impedance (ohm)	Delta (ohm)	Imaginary Impedance (ohm)	Delta (ohm)	Return-Loss (dB)	Delta (%)	Real Impedance (ohm)	Delta (ohm)	Imaginary Impedance (ohm)	Delta (ohm)
2018.12.5	-28.9		52.6		-2.56		-22.3		47.2		-6.92	
2019.11.25	-29.2	1.0	53.4	0.8	-1.48	1.08	-21.1	5.4	46.6	-0.6	-7.81	-0.89

<Justification of the extended calibration>

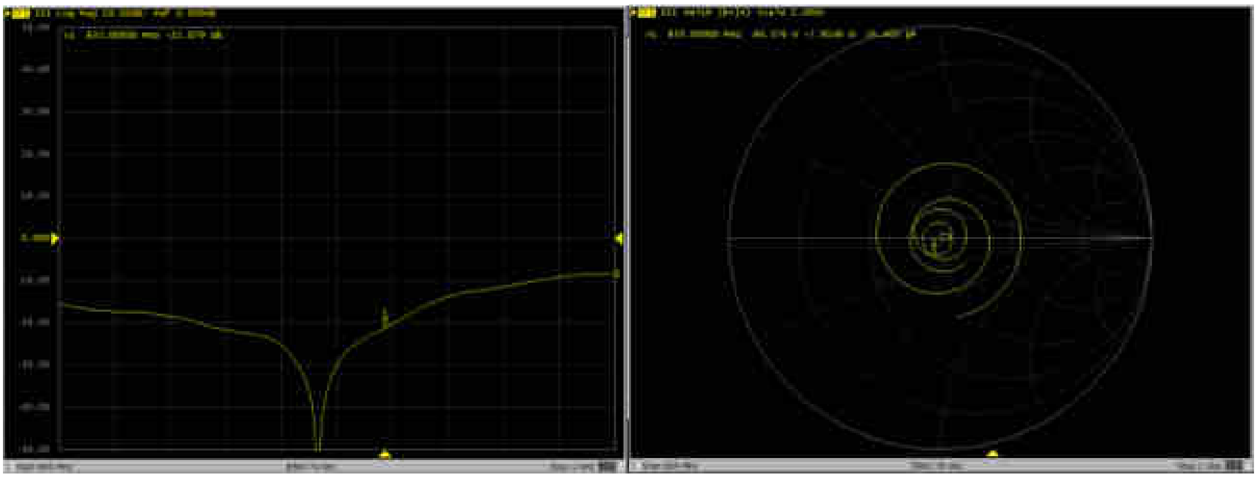
The return loss is < -20dB, within 20% of prior calibration; the impedance is within 5 ohm of prior calibration. Therefore the verification result should support extended calibration.

Dipole Verification Data> 835V2, serial no. 4d162

835MHz - Head



835MHz – Body



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Client **Sporton** **Certificate No: Z19-60087**

CALIBRATION CERTIFICATE

Object	D2450V2 - SN: 908
Calibration Procedure(s)	FF-Z11-003-01 Calibration Procedures for dipole validation kits
Calibration date:	March 25, 2019

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)℃ and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	106277	20-Aug-18 (CTTL, No.J18X06862)	Aug-19
Power sensor NRP8S	104291	20-Aug-18 (CTTL, No.J18X06862)	Aug-19
Reference Probe EX3DV4	SN 3617	31-Jan-19(SPEAG,No.EX3-3617_Jan19)	Jan-20
DAE4	SN 1331	06-Feb-19(SPEAG,No.DAE4-1331_Feb19)	Feb-20
Secondary Standards	**ID #**	**Cal Date(Calibrated by, Certificate No.)**	**Scheduled Calibration**
Signal Generator E4438C	MY49071430	23-Jan-19 (CTTL, No.J19X00336)	Jan-20
NetworkAnalyzer E5071C	MY46110673	24-Jan-19 (CTTL, No.J19X00547)	Jan-20

	Name	Function	Signature
Calibrated by:	Zhao Jing	SAR Test Engineer	
Reviewed by:	Lin Hao	SAR Test Engineer	
Approved by:	Qi Dianyuan	SAR Project Leader	

Issued: March 28, 2019

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Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORMx,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Measurement procedure for assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices- Part 1: Device used next to the ear (Frequency range of 300MHz to 6GHz)", July 2016
c) IEC 62209-2, "Procedure to measure the Specific Absorption Rate (SAR) For wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz)", March 2010
d) KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

Additional Documentation:

e) DASY4/5 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.

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%.

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Measurement Conditions

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

DASY Version	DASY52	52.10.2.1495
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	39.6 ± 6 %	1.84 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.3 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**52.8 W/kg ± 18.8 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	6.07 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**24.2 W/kg ± 18.7 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	53.8 ± 6 %	2.00 mho/m ± 6 %
Body TSL temperature change during test	<1.0 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	12.8 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**50.8 W/kg ± 18.8 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	5.91 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**23.6 W/kg ± 18.7 % (k=2)**

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Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	57.3Ω+ 5.18 jΩ
Return Loss	- 21.6dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	52.6Ω+ 5.81 jΩ
Return Loss	- 24.1dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.020 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. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
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

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DASY5 Validation Report for Head TSL Date: 03.25.2019

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 908

Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium parameters used: f = 2450 MHz; σ = 1.841 S/m; ε_r = 39.63; ρ = 1000 kg/m3

Phantom section: Right Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3617; ConvF(7.62, 7.62, 7.62) @ 2450 MHz; Calibrated: 1/31/2019
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1331; Calibrated: 2/6/2019
- Phantom: MFP_V5.1C ; Type: QD 000 P51CA; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7450)

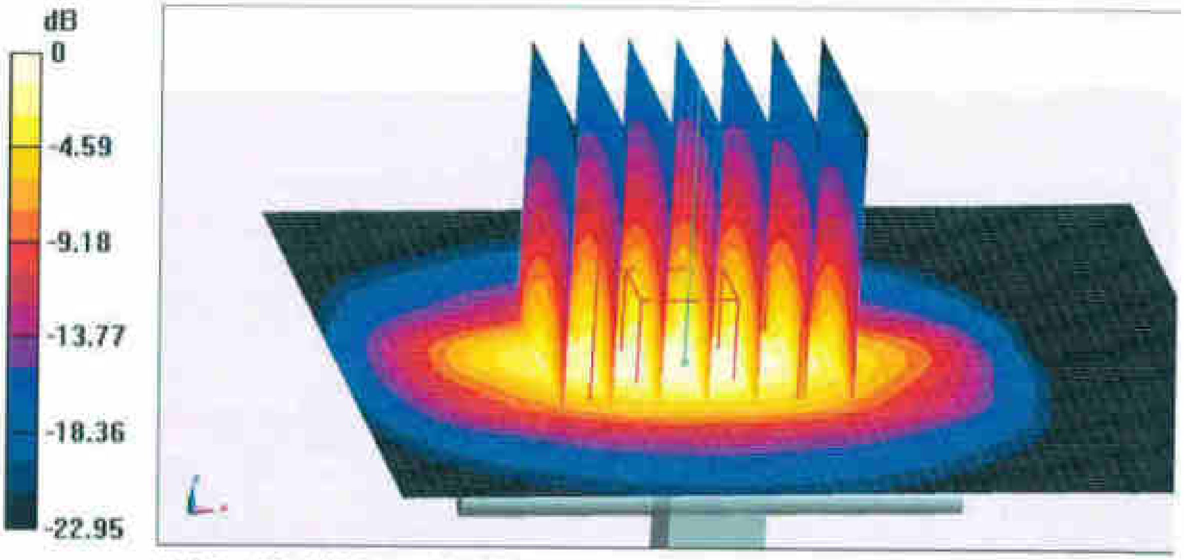
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 96.04 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 28.3 W/kg

SAR(1 g) = 13.3 W/kg; SAR(10 g) = 6.07 W/kg

Maximum value of SAR (measured) = 22.4 W/kg



0 dB = 22.4 W/kg = 13.50 dBW/kg

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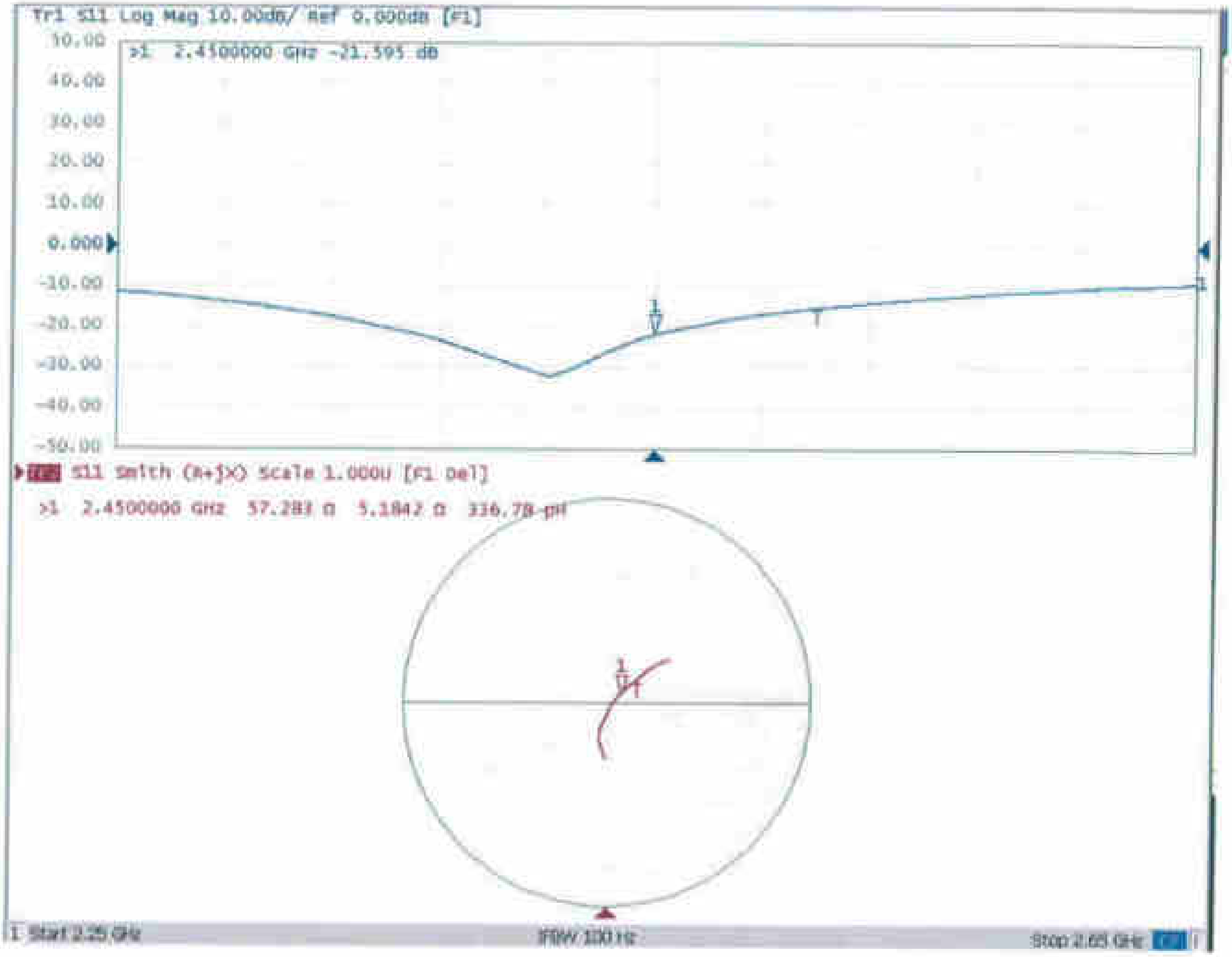
Impedance Measurement Plot for Head TSL



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DASY5 Validation Report for Body TSL Date: 03.25.2019

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 908

Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium parameters used: f = 2450 MHz; σ = 2.003 S/m; ε_r = 53.78; ρ = 1000 kg/m3

Phantom section: Center Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3617; ConvF(7.79, 7.79, 7.79) @ 2450 MHz; Calibrated: 1/31/2019
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1331; Calibrated: 2/6/2019
- Phantom: MFP_V5.1C ; Type: QD 000 P51CA; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7450)

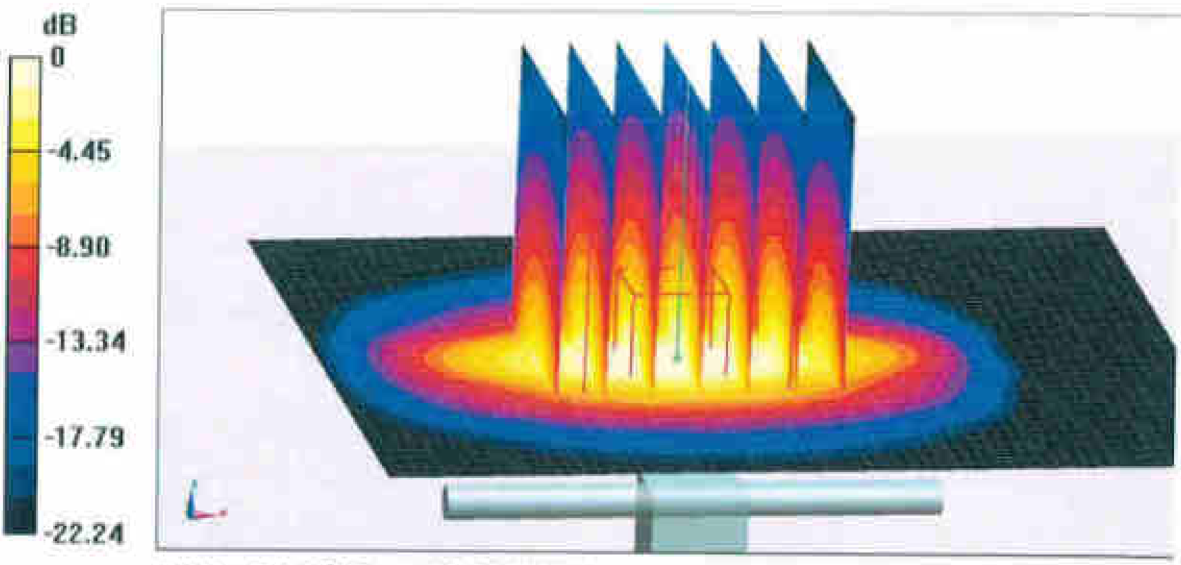
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 95.51 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 27.1 W/kg

SAR(1 g) = 12.8 W/kg; SAR(10 g) = 5.91 W/kg

Maximum value of SAR (measured) = 21.4 W/kg



0 dB = 21.4 W/kg = 13.30 dBW/kg

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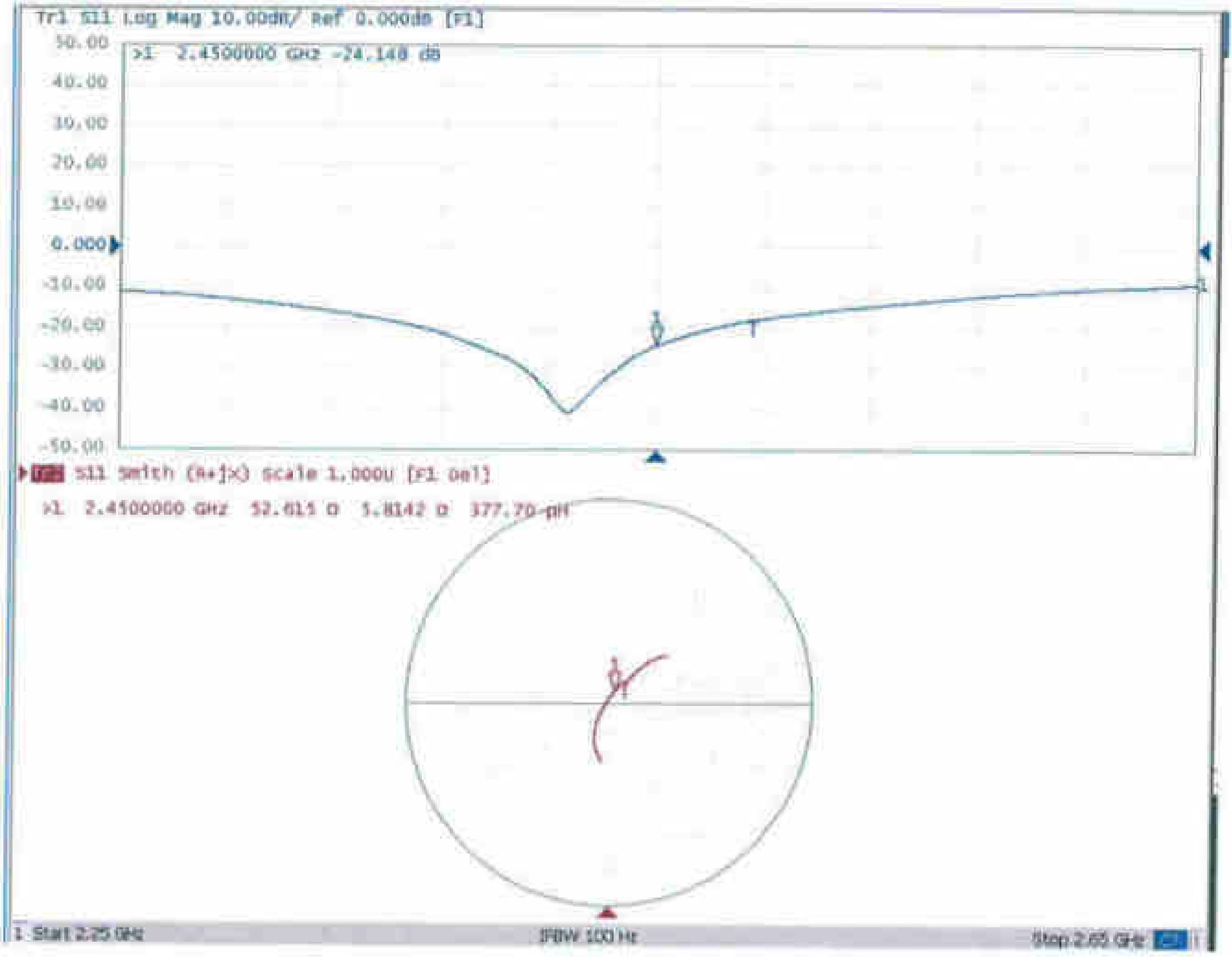
Impedance Measurement Plot for Body TSL



D2450V2, Serial No. 908 Extended Dipole Calibrations

Referring to KDB 865664 D01 v01r02, if dipoles are verified in return loss (<-20dB, within 20% of prior calibration), and in impedance (within 5 ohm of prior calibration), the annual calibration is not necessary and the calibration interval can be extended.

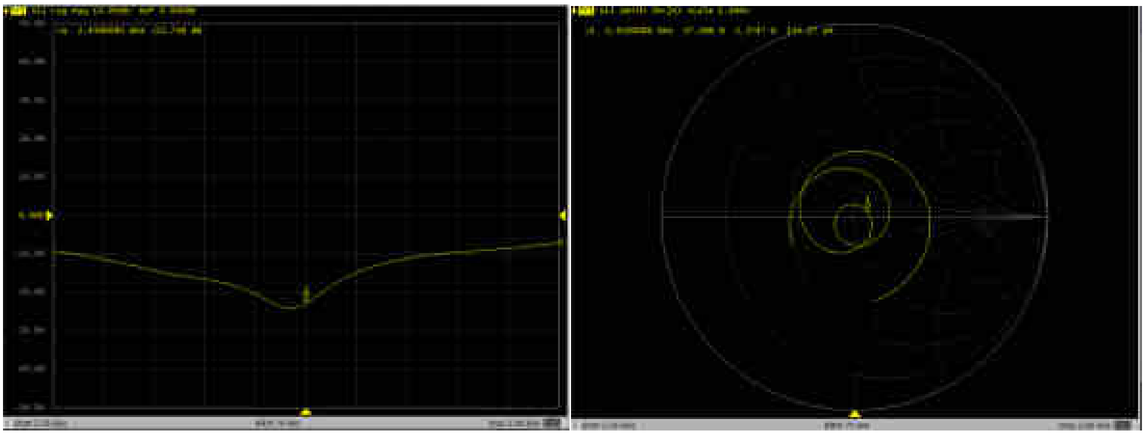
2450V2 – serial no. 908												
	2450 Head						2450 Body					
Date of Measurement	Return-Loss (dB)	Delta (%)	Real Impedance (ohm)	Delta (ohm)	Imaginary Impedance (ohm)	Delta (ohm)	Return-Loss (dB)	Delta (%)	Real Impedance (ohm)	Delta (ohm)	Imaginary Impedance (ohm)	Delta (ohm)
2019.3.25	-21.6		57.3		5.2		-24.1		52.6		5.8	
2020.3.24	-22.7	-0.05	57.5	-0.18	2.4	2.81	-26.1	-0.08	55.01	-2.40	1.493	4.32

<Justification of the extended calibration>

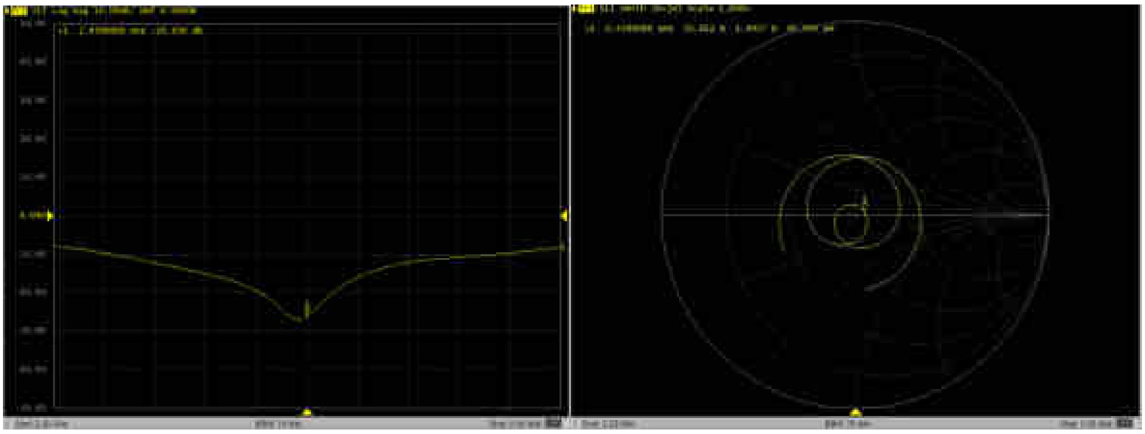
The return loss is < -20dB, within 20% of prior calibration; the impedance is within 5 ohm of prior calibration. Therefore the verification result should support extended calibration.

Dipole Verification Data> D2450V2, serial no. 908

2450MHz – Head



2450MHz – Body



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Client **Sporton** **Certificate No: Z18-60537**

CALIBRATION CERTIFICATE

Object	D2600V2 - SN: 1070
Calibration Procedure(s)	FF-Z11-003-01 Calibration Procedures for dipole validation kits
Calibration date:	December 7, 2018

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)℃ and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRVD	102196	07-Mar-18 (CTTL, No.J18X01510)	Mar-19
Power sensor NRV-Z5	100596	07-Mar-18 (CTTL, No.J18X01510)	Mar-19
Reference Probe EX3DV4	SN 7514	27-Aug-18(SPEAG,No.EX3-7514_Aug18)	Aug-19
DAE4	SN 1555	20-Aug-18(SPEAG,No.DAE4-1555_Aug18)	Aug-19
Secondary Standards	**ID #**	**Cal Date(Calibrated by, Certificate No.)**	**Scheduled Calibration**
Signal Generator E4438C	MY49071430	23-Jan-18 (CTTL, No.J18X00560)	Jan-19
Network Analyzer E5071C	MY46110673	24-Jan-18 (CTTL, No.J18X00561)	Jan-19

	Name	Function	Signature
Calibrated by:	Zhao Jing	SAR Test Engineer	
Reviewed by:	Lin Hao	SAR Test Engineer	
Approved by:	Qi Dianyuan	SAR Project Leader	

Issued: December 10, 2018

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Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORMx,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013

b) IEC 62209-1, "Measurement procedure for assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices- Part 1: Device used next to the ear (Frequency range of 300MHz to 6GHz)", July 2016

c) IEC 62209-2, "Procedure to measure the Specific Absorption Rate (SAR) For wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz)", March 2010

d) KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

Additional Documentation:

e) DASY4/5 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.

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%.

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Measurement Conditions

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

DASY Version	DASY52	52.10.2.1495
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2600 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	39.0	1.96 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	39.1 ± 6 %	1.93 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	14.4 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**58.1 mW /g ± 18.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	6.50 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**26.1 mW /g ± 18.7 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	52.5	2.16 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	51.0 ± 6 %	2.18 mho/m ± 6 %
Body TSL temperature change during test	<1.0 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	13.8 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**54.6 mW /g ± 18.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	6.18 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**24.6 mW /g ± 18.7 % (k=2)**

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Appendix(Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	48.6Ω- 6.33jΩ
Return Loss	- 23.7dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	44.8Ω- 5.36jΩ
Return Loss	- 22.1dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.015 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. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
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

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DASY5 Validation Report for Head TSL Date: 12.06.2018

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN: 1070

Communication System: UID 0, CW; Frequency: 2600 MHz; Duty Cycle: 1:1

Medium parameters used: f = 2600 MHz; σ = 1.926 S/m; ε_r = 39.1; ρ = 1000 kg/m3

Phantom section: Center Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7514; ConvF(6.92, 6.92, 6.92) @ 2600 MHz; Calibrated: 8/27/2018
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1555; Calibrated: 8/20/2018
- Phantom: MFP_V5.1C ; Type: QD 000 P51CA; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7450)

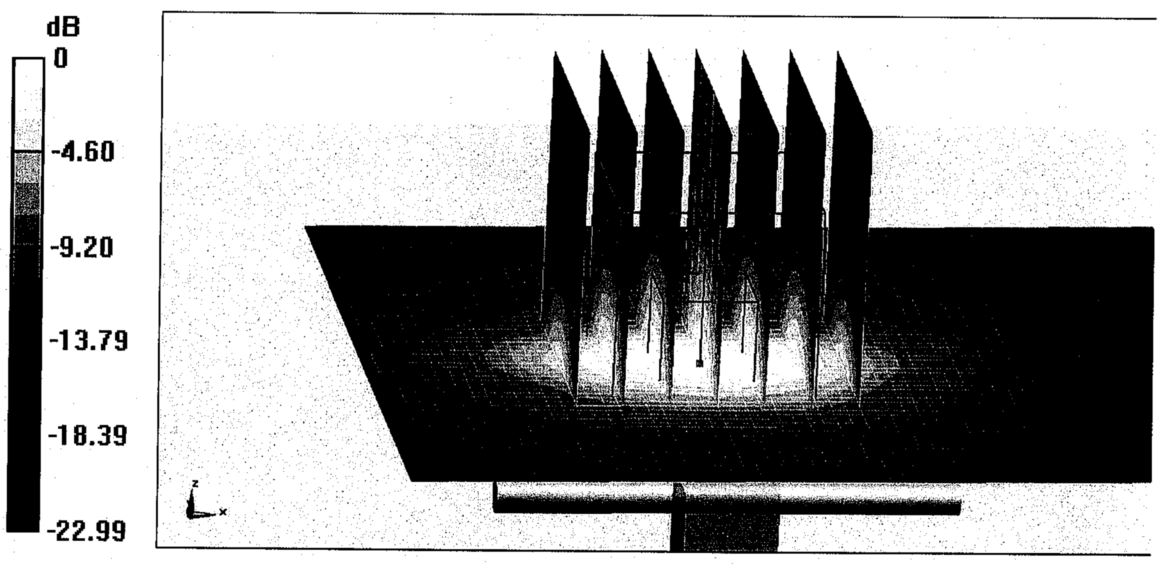
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 99.07 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 31.1 W/kg

SAR(1 g) = 14.4 W/kg; SAR(10 g) = 6.5 W/kg

Maximum value of SAR (measured) = 24.7 W/kg



0 dB = 24.7 W/kg = 13.93 dBW/kg

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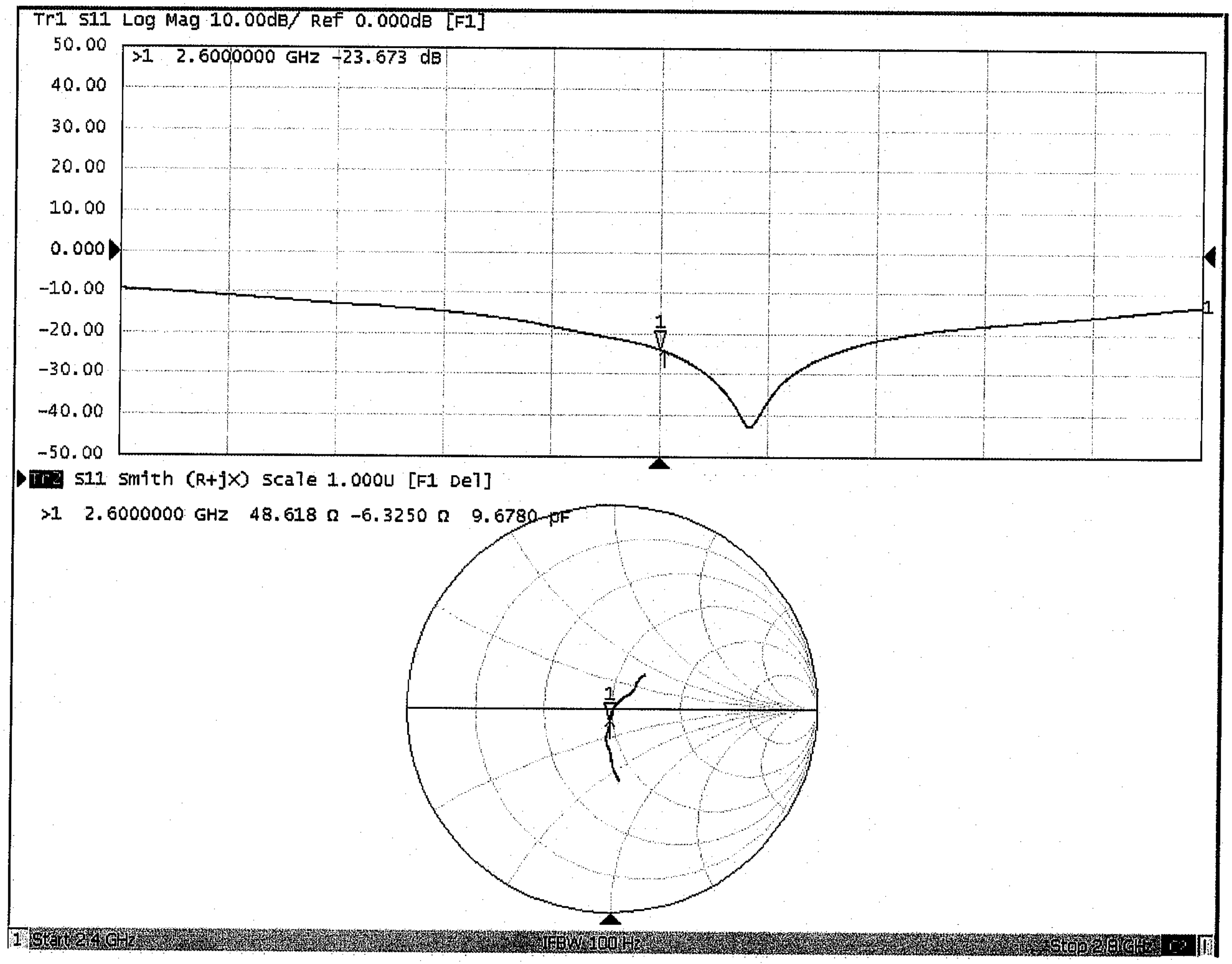
Impedance Measurement Plot for Head TSL



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DASY5 Validation Report for Body TSL Date: 12.06.2018

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN: 1070

Communication System: UID 0, CW; Frequency: 2600 MHz; Duty Cycle: 1:1

Medium parameters used: f = 2600 MHz; σ = 2.181 S/m; ε_r = 51.03; ρ = 1000 kg/m3

Phantom section: Right Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7514; ConvF(7.06, 7.06, 7.06) @ 2600 MHz; Calibrated: 8/27/2018
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1555; Calibrated: 8/20/2018
- Phantom: MFP_V5.1C ; Type: QD 000 P51CA; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7450)

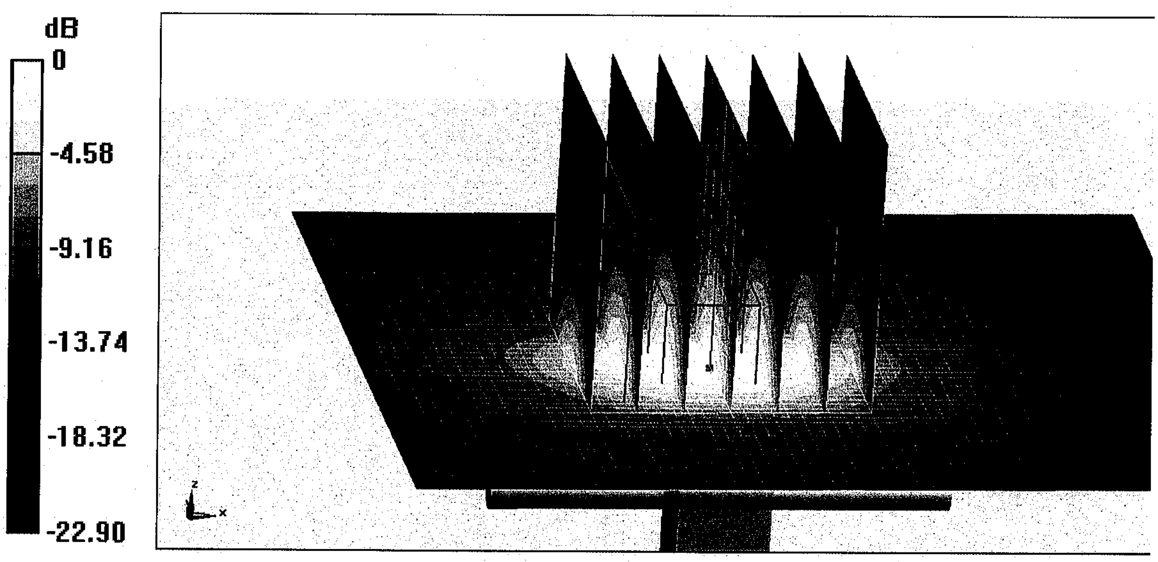
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 87.90 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 29.5 W/kg

SAR(1 g) = 13.8 W/kg; SAR(10 g) = 6.18 W/kg

Maximum value of SAR (measured) = 23.6 W/kg



0 dB = 23.6 W/kg = 13.73 dBW/kg

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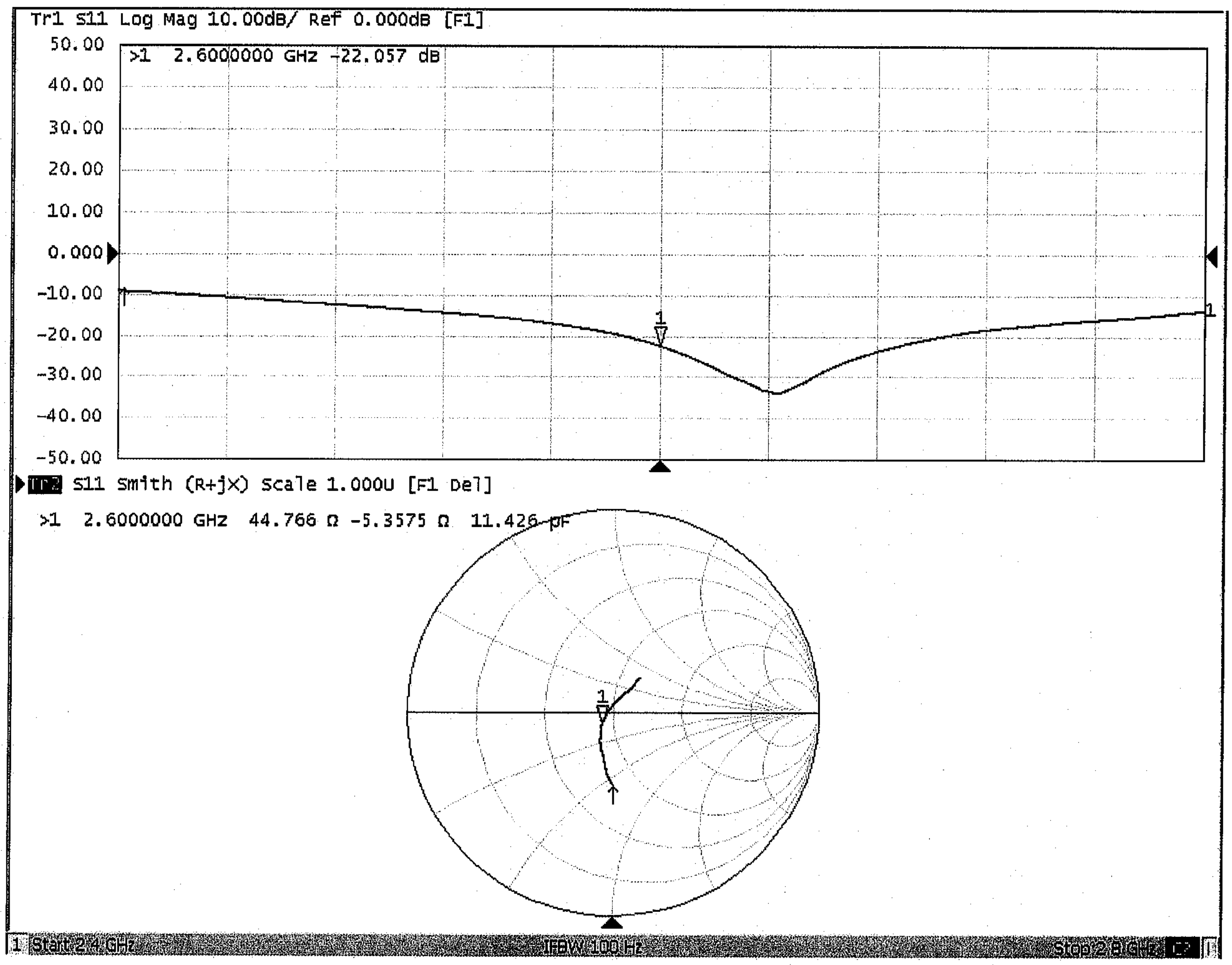
Impedance Measurement Plot for Body TSL



D2600V2, Serial No. 1070 Extended Dipole Calibrations

Referring to KDB 865664 D01 v01r02, if dipoles are verified in return loss (<-20dB, within 20% of prior calibration), and in impedance (within 5 ohm of prior calibration), the annual calibration is not necessary and the calibration interval can be extended.

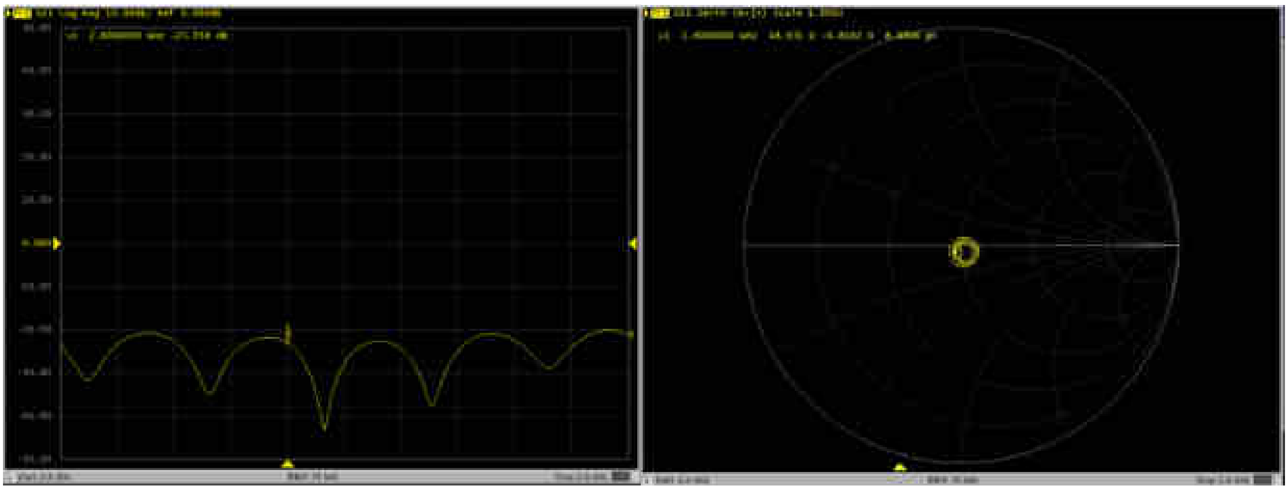
D2600V2 – serial no. 1070												
	2600 Head						2600 Body					
Date of Measurement	Return-Loss (dB)	Delta (%)	Real Impedance (ohm)	Delta (ohm)	Imaginary Impedance (ohm)	Delta (ohm)	Return-Loss (dB)	Delta (%)	Real Impedance (ohm)	Delta (ohm)	Imaginary Impedance (ohm)	Delta (ohm)
2018.12.7	-23.7		48.6		-6.33		-22.1		44.8		-5.36	
2019.11.25	-23.1	2.5	48.6	0	-6.82	-0.49	-22.0	0.5	45.3	0.5	-4.65	0.71

<Justification of the extended calibration>

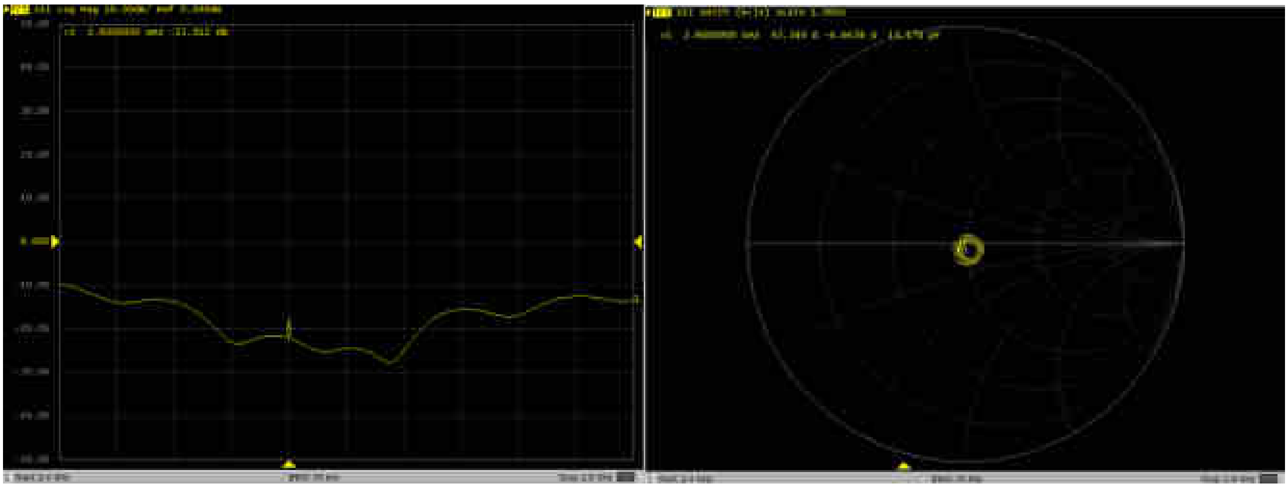
The return loss is < -20dB, within 20% of prior calibration; the impedance is within 5 ohm of prior calibration. Therefore the verification result should support extended calibration.

Dipole Verification Data> D2600V2, serial no. 1070

2600MHz - Head



2600MHz – Body



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Accreditation No.: **SCS 0108**

Client **Sporton**

Certificate No: **D5GHzV2-1113_Sep19**

CALIBRATION CERTIFICATE

Object	D5GHzV2 - SN:1113
Calibration procedure(s)	QA CAL-22.v4 Calibration Procedure for SAR Validation Sources between 3-6 GHz
Calibration date:	September 24, 2019

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 NRP	SN: 104778	03-Apr-19 (No. 217-02892/02893)	Apr-20
Power sensor NRP-Z91	SN: 103244	03-Apr-19 (No. 217-02892)	Apr-20
Power sensor NRP-Z91	SN: 103245	03-Apr-19 (No. 217-02893)	Apr-20
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-19 (No. 217-02894)	Apr-20
Type-N mismatch combination	SN: 5047.2 / 06327	04-Apr-19 (No. 217-02895)	Apr-20
Reference Probe EX3DV4	SN: 3503	25-Mar-19 (No. EX3-3503_Mar19)	Mar-20
DAE4	SN: 601	30-Apr-19 (No. DAE4-601_Apr19)	Apr-20

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB39512475	30-Oct-14 (in house check Feb-19)	In house check: Oct-20
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-18)	In house check: Oct-20
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-18)	In house check: Oct-19

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: September 25, 2019

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

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Accreditation No.: **SCS 0108**

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 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

e) DASY4/5 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.

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%.

Measurement Conditions

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

DASY Version	DASY5	V52.10.2
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy = 4.0 mm, dz = 1.4 mm	Graded Ratio = 1.4 (Z direction)
Frequency	5250 MHz ± 1 MHz 5600 MHz ± 1 MHz 5750 MHz ± 1 MHz	

Head TSL parameters at 5250 MHz

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	35.9	4.71 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.1 ± 6 %	4.53 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5250 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.09 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**80.5 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.33 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**23.1 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	35.5	5.07 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.6 ± 6 %	4.88 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5600 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.40 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**83.4 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.40 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**23.8 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5750 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.4	5.22 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.4 ± 6 %	5.03 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5750 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.06 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**80.0 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.30 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**22.8 W/kg ± 19.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL at 5250 MHz

Impedance, transformed to feed point	51.7 Ω - 6.2 jΩ
Return Loss	- 24.0 dB

Antenna Parameters with Head TSL at 5600 MHz

Impedance, transformed to feed point	56.0 Ω - 2.7 jΩ
Return Loss	- 24.1 dB

Antenna Parameters with Head TSL at 5750 MHz

Impedance, transformed to feed point	56.7 Ω - 1.0 jΩ
Return Loss	- 23.9 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.195 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. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
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

DASY5 Validation Report for Head TSL

Date: 24.09.2019

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1113

Communication System: UID 0 - CW; Frequency: 5250 MHz, Frequency: 5600 MHz, Frequency: 5750 MHz
Medium parameters used: f = 5250 MHz; σ = 4.53 S/m; ε_r = 35.1; ρ = 1000 kg/m^3 ,
Medium parameters used: f = 5600 MHz; σ = 4.88 S/m; ε_r = 34.6; ρ = 1000 kg/m^3 ,
Medium parameters used: f = 5750 MHz; σ = 5.03 S/m; ε_r = 34.4; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.4, 5.4, 5.4) @ 5250 MHz, ConvF(4.95, 4.95, 4.95) @ 5600 MHz, ConvF(4.98, 4.98, 4.98) @ 5750 MHz; Calibrated: 25.03.2019
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.04.2019
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.2(1504); SEMCAD X 14.6.12(7470)

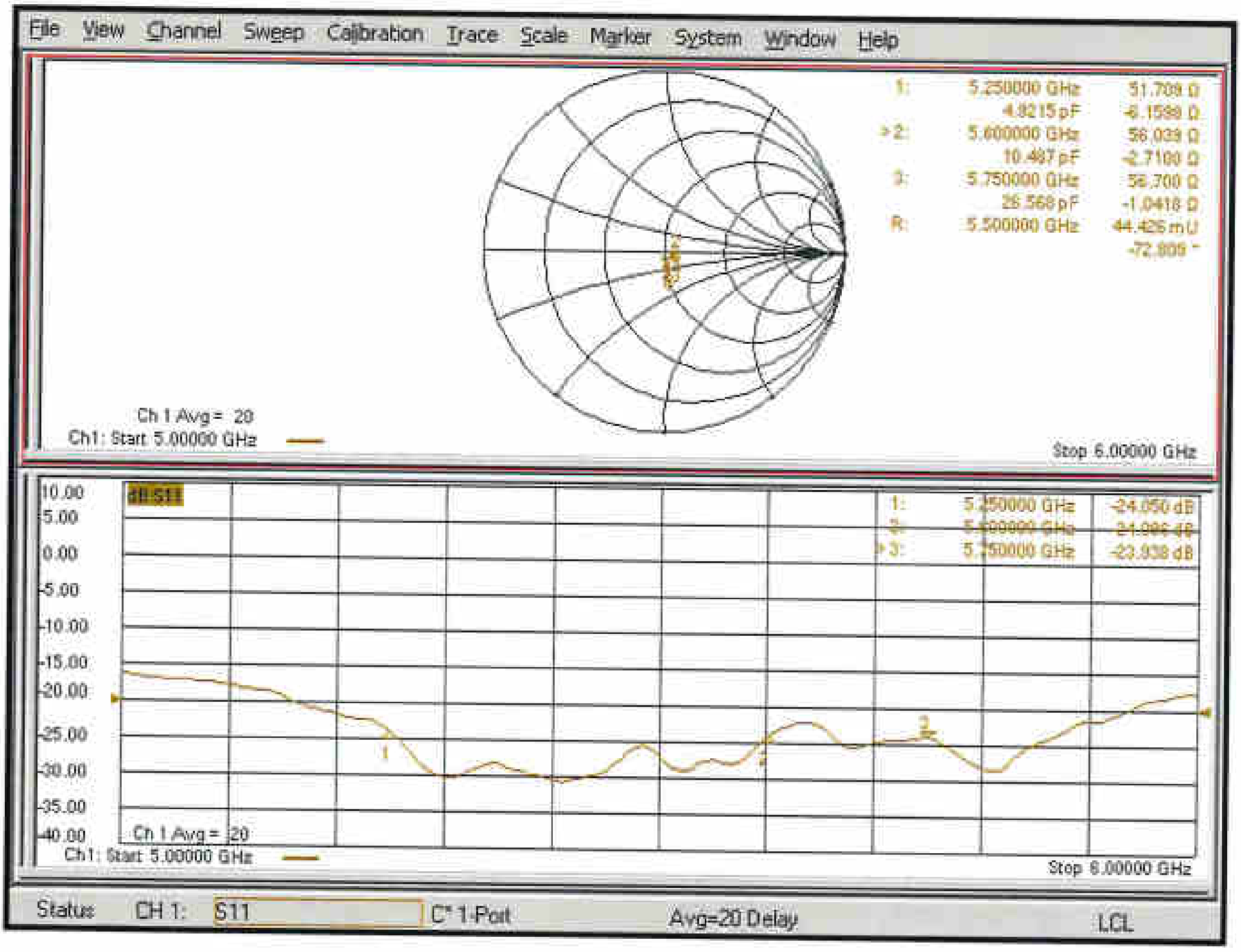
Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5250 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 78.54 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 27.9 W/kg
SAR(1 g) = 8.09 W/kg; SAR(10 g) = 2.33 W/kg
Maximum value of SAR (measured) = 18.1 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 78.00 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 31.1 W/kg
SAR(1 g) = 8.40 W/kg; SAR(10 g) = 2.40 W/kg
Maximum value of SAR (measured) = 19.4 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5750 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 75.13 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 31.8 W/kg
SAR(1 g) = 8.06 W/kg; SAR(10 g) = 2.30 W/kg
Maximum value of SAR (measured) = 19.0 W/kg

0 dB = 18.1 W/kg = 12.58 dBW/kg

Impedance Measurement Plot for Head TSL



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Client : Amphenol

Certificate No: Z20-60071

CALIBRATION CERTIFICATE

Object	DAE4 - SN: 799
Calibration Procedure(s)	FF-Z11-002-01 Calibration Procedure for the Data Acquisition Electronics (DAEx)
Calibration date:	February 10, 2020

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)℃ and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Process Calibrator 753	1971018	24-Jun-19 (CTTL, No.J19X05126)	Jun-20

	Name	Function	Signature
Calibrated by:	Yu Zongying	SAR Test Engineer	
Reviewed by:	Lin Hao	SAR Test Engineer	
Approved by:	Qi Dianyuan	SAR Project Leader	

Issued: February 11, 2020

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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 report provide only calibration results for DAE, it does not contain other performance test results.

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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	405.644 ± 0.15% (k=2)	405.087 ± 0.15% (k=2)	405.831 ± 0.15% (k=2)
Low Range	3.98565 ± 0.7% (k=2)	4.00142 ± 0.7% (k=2)	4.00514 ± 0.7% (k=2)

Connector Angle

Connector Angle to be used in DASY system	177° ± 1 °

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Accreditation No.: SCS 0108

Client **Auden**

Certificate No: DAE4-1356_May20

CALIBRATION CERTIFICATE

Object	DAE4 - SD 000 D04 BJ - SN: 1356
Calibration procedure(s)	QA CAL-06.v30 Calibration procedure for the data acquisition electronics (DAE)
Calibration date:	May 19, 2020

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
Keithley Multimeter Type 2001	SN: 0810278	03-Sep-19 (No:25949)	Sep-20
Secondary Standards	**ID #**	**Check Date (in house)**	**Scheduled Check**
Auto DAE Calibration Unit	SE UWS 053 AA 1001	09-Jan-20 (in house check)	In house check: Jan-21
Calibrator Box V2.1	SE UMS 006 AA 1002	09-Jan-20 (in house check)	In house check: Jan-21

	Name	Function	Signature
Calibrated by:	Dominique Steffen	Laboratory Technician	
Approved by:	Sven Kühn	Deputy Manager	

Issued: May 20, 2020

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Accreditation No.: **SCS 0108**

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:* Typical value for information: 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	404.180 ± 0.02% (k=2)	403.982 ± 0.02% (k=2)	404.201 ± 0.02% (k=2)
Low Range	3.97702 ± 1.50% (k=2)	3.96329 ± 1.50% (k=2)	3.97892 ± 1.50% (k=2)

Connector Angle

Connector Angle to be used in DASY system	268.5 ° ± 1 °

Appendix (Additional assessments outside the scope of SCS0108)

1. DC Voltage Linearity

High Range		Reading (μV)	Difference (μV)	Error (%)
Channel X	+ Input	200036.91	4.93	0.00
Channel X	+ Input	20003.33	-2.05	-0.01
Channel X	- Input	-20003.72	1.76	-0.01
Channel Y	+ Input	200031.46	-0.39	-0.00
Channel Y	+ Input	20003.32	-1.93	-0.01
Channel Y	- Input	-20005.93	-0.40	0.00
Channel Z	+ Input	200028.99	-3.17	-0.00
Channel Z	+ Input	20001.58	-3.59	-0.02
Channel Z	- Input	-20007.24	-1.55	0.01

Low Range		Reading (μV)	Difference (μV)	Error (%)
Channel X	+ Input	2001.23	0.11	0.01
Channel X	+ Input	201.14	-0.00	-0.00
Channel X	- Input	-199.01	-0.14	0.07
Channel Y	+ Input	2000.67	-0.35	-0.02
Channel Y	+ Input	199.89	-1.12	-0.56
Channel Y	- Input	-198.23	0.78	-0.39
Channel Z	+ Input	2000.97	-0.10	-0.01
Channel Z	+ Input	200.56	-0.38	-0.19
Channel Z	- Input	-199.65	-0.57	0.29

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	-7.39	-9.12
	- 200	10.05	8.28
Channel Y	200	-10.37	-10.55
	- 200	8.09	8.04
Channel Z	200	-16.40	-15.83
	- 200	14.16	14.37

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	-	2.10	-3.79
Channel Y	200	7.59	-	3.07
Channel Z	200	9.79	5.97	-

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	16325	15231
Channel Y	16143	12708
Channel Z	15880	15875

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	0.69	-0.54	1.75	0.38
Channel Y	-0.88	-2.99	1.75	0.75
Channel Z	-0.46	-1.79	0.32	0.37

6. Input Offset Current

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

7. Input Resistance (Typical values for information)

	Zeroing (kOhm)	Measuring (MOhm)
Channel X	200	200
Channel Y	200	200
Channel Z	200	200

8. Low Battery Alarm Voltage (Typical values for information)

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

9. Power Consumption (Typical values for information)

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

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Accreditation No.: **SCS 0108**

Client Sporton

Certificate No: EX3-3843_Sep19

CALIBRATION CERTIFICATE

Object	EX3DV4 - SN:3843
Calibration procedure(s)	QA CAL-01.v9, QA CAL-14.v5, QA CAL-23.v5, QA CAL-25.v7 Calibration procedure for dosimetric E-field probes
Calibration date:	September 26, 2019

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 NRP	SN: 104778	03-Apr-19 (No. 217-02892/02893)	Apr-20
Power sensor NRP-Z91	SN: 103244	03-Apr-19 (No. 217-02892)	Apr-20
Power sensor NRP-Z91	SN: 103245	03-Apr-19 (No. 217-02893)	Apr-20
Reference 20 dB Attenuator	SN: S5277 (20x)	04-Apr-19 (No. 217-02894)	Apr-20
DAE4	SN: 660	19-Dec-18 (No. DAE4-660_Dec18)	Dec-19
Reference Probe ES3DV2	SN: 3013	31-Dec-18 (No. ES3-3013_Dec18)	Dec-19
Secondary Standards	ID	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB41293874	06-Apr-16 (in house check Jun-18)	In house check: Jun-20
Power sensor E4412A	SN: MY41498087	06-Apr-16 (in house check Jun-18)	In house check: Jun-20
Power sensor E4412A	SN: 000110210	06-Apr-16 (in house check Jun-18)	In house check: Jun-20
RF generator HP 8648C	SN: US3642U01700	04-Aug-99 (in house check Jun-18)	In house check: Jun-20
Network Analyzer E8358A	SN: US41080477	31-Mar-14 (in house check Oct-18)	In house check: Oct-19

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: October 1, 2019

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Accreditation No.: SCS 0108

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C, D	modulation dependent linearization parameters
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
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, ", "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

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 affect 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 with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *PAR:* PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- *Ax,y,z; Bx,y,z; Cx,y,z; Dx,y,z; VRx,y,z: A, B, C, D* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *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.
- *Connector Angle*: The angle is assessed using the information gained by determining the *NORMx* (no uncertainty required).

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3843

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.34	0.35	0.25	± 10.1 %
DCP (mV)[B]	110.9	96.1	101.1	

Calibration Results for Modulation Response

UID	Communication System Name		A dB	B dB√μV	C	D dB	VR mV	Max dev.	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	134.1	±3.8 %	± 4.7 %
		Y	0.0	0.0	1.0		146.5		
		Z	0.0	0.0	1.0		132.2		

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 Norm X,Y,Z do not affect the E^2-field uncertainty inside TSL (see Page 5).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3843

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	-34.3
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	1.4 mm

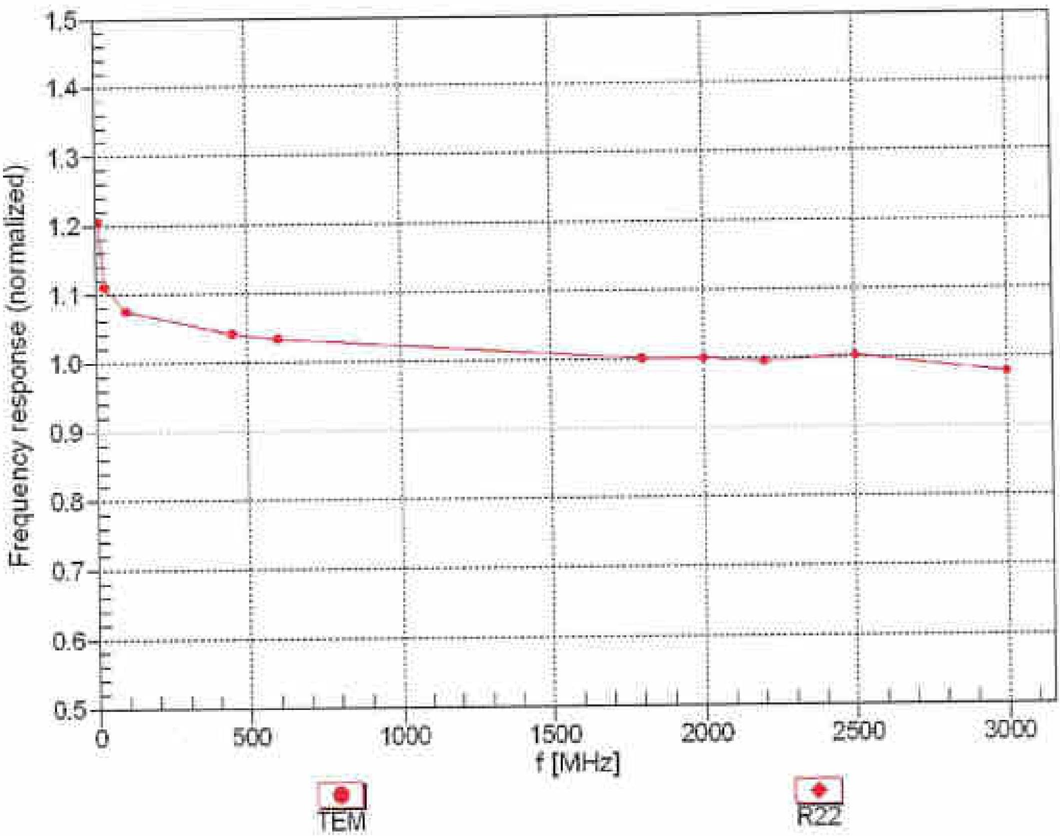
DASY/EASY - Parameters of Probe: EX3DV4 - SN:3843

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unc (k=2)
750	41.9	0.89	9.37	9.37	9.37	0.50	0.87	± 12.0 %
835	41.5	0.90	9.07	9.07	9.07	0.43	0.80	± 12.0 %
900	41.5	0.97	8.92	8.92	8.92	0.41	0.90	± 12.0 %
1450	40.5	1.20	8.17	8.17	8.17	0.32	0.80	± 12.0 %
1750	40.1	1.37	7.95	7.95	7.95	0.34	0.87	± 12.0 %
1900	40.0	1.40	7.67	7.67	7.67	0.32	0.87	± 12.0 %
2000	40.0	1.40	7.66	7.66	7.66	0.34	0.87	± 12.0 %
2300	39.5	1.67	7.30	7.30	7.30	0.26	0.90	± 12.0 %
2450	39.2	1.80	7.06	7.06	7.06	0.35	0.90	± 12.0 %
2600	39.0	1.96	6.90	6.90	6.90	0.43	0.80	± 12.0 %
5250	35.9	4.71	4.74	4.74	4.74	0.40	1.80	± 14.0 %
5600	35.5	5.07	4.47	4.47	4.47	0.40	1.80	± 14.0 %
5750	35.4	5.22	4.44	4.44	4.44	0.40	1.80	± 14.0 %

[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Validity of ConvF assessed at 6 MHz is 4-9 MHz, and ConvF assessed at 13 MHz is 9-19 MHz. Above 5 GHz frequency validity can be extended to ± 110 MHz.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

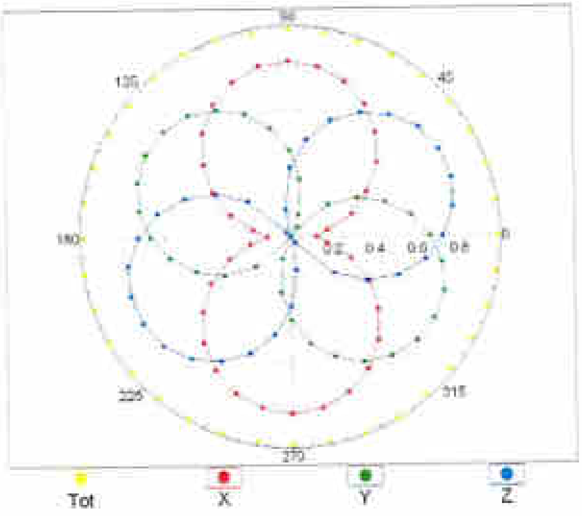
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



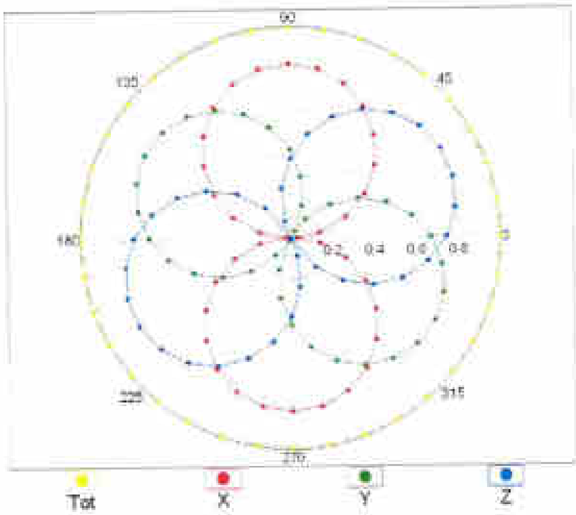
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

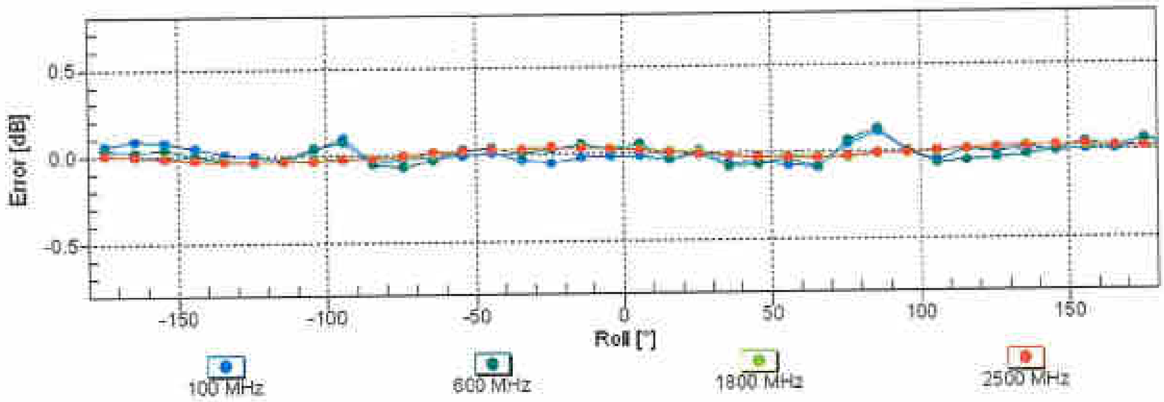
Receiving Pattern (ϕ), $\vartheta = 0°$

f=600 MHz,TEM



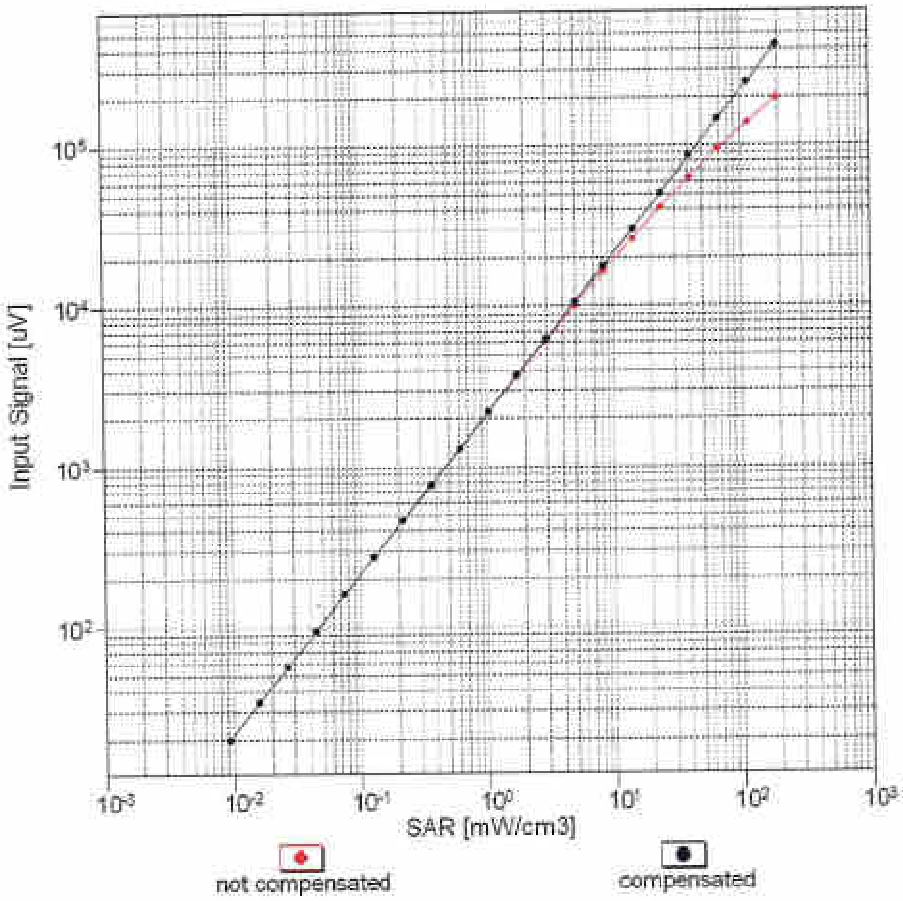
f=1800 MHz,R22

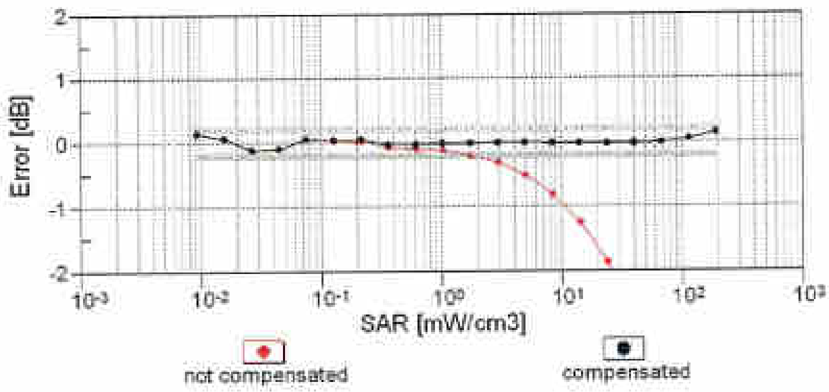




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

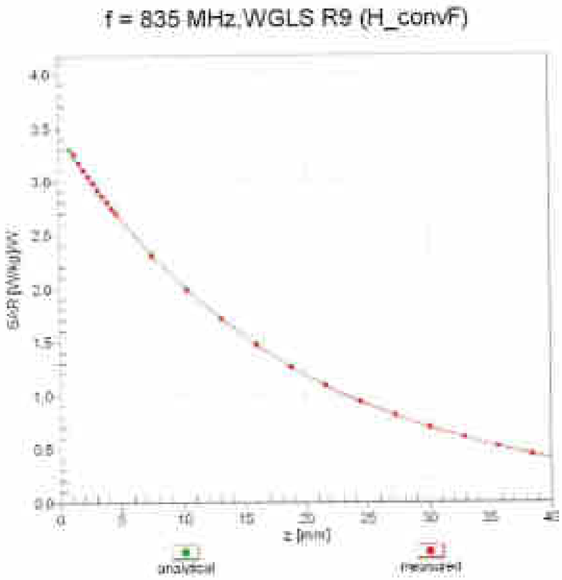
Dynamic Range f(SAR_{head})
(TEM cell , f_{eval}= 1900 MHz)

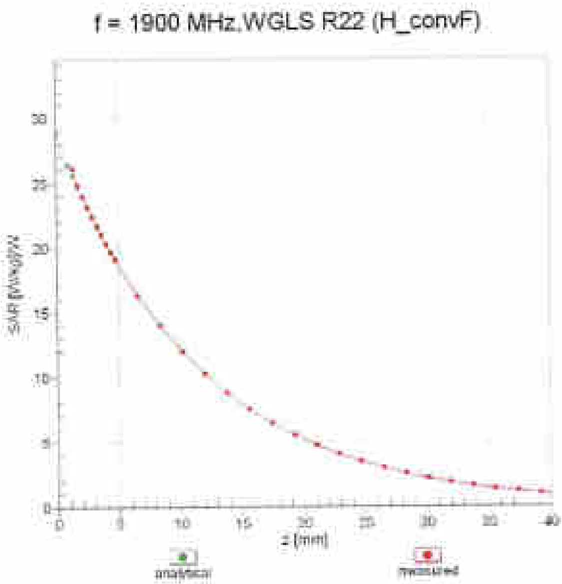




Uncertainty of Linearity Assessment: ± 0.6% (k=2)

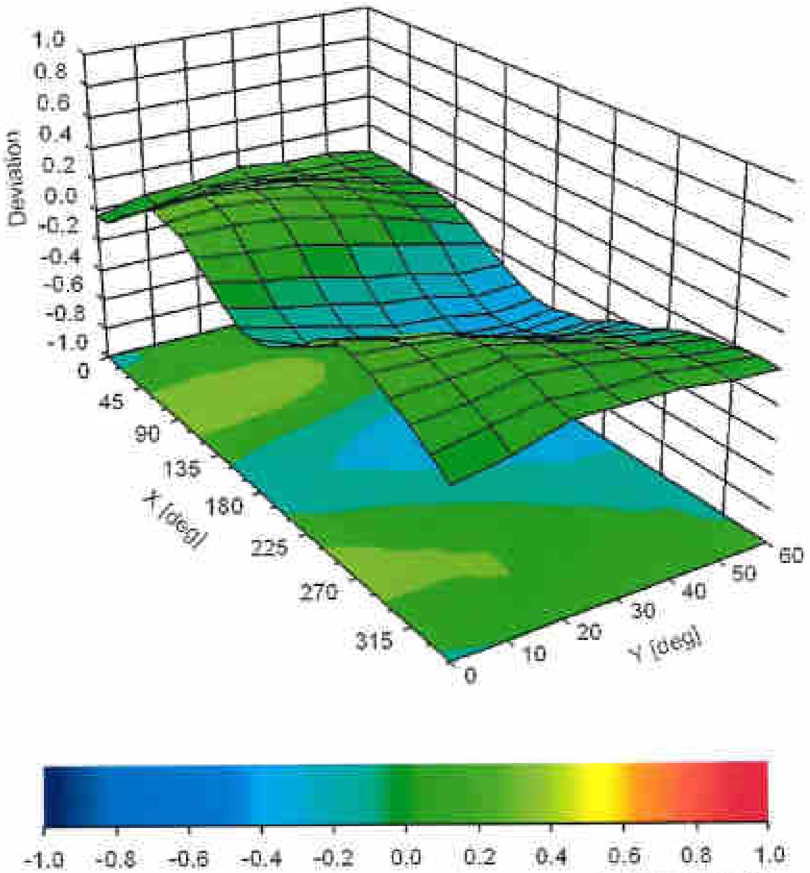
Conversion Factor Assessment





Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz



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

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校准
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CNAS L0570

Client: Auden

Certificate No: Z20-60166

CALIBRATION CERTIFICAT

Object	EX3DV4 - SN : 3826
Calibration Procedure(s)	FF-Z11-004-01 Calibration Procedures for Dosimetric E-field Probes
Calibration date:	May 20, 2020

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)℃ and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	101919	18-Jun-19(CTTL, No.J19X05125)	Jun-20
Power sensor NRP-Z91	101547	18-Jun-19(CTTL, No.J19X05125)	Jun-20
Power sensor NRP-Z91	101548	18-Jun-19(CTTL, No.J19X05125)	Jun-20
Reference 10dBAttenuator	18N50W-10dB	10-Feb-20(CTTL, No.J20X00525)	Feb-22
Reference 20dBAttenuator	18N50W-20dB	10-Feb-20(CTTL, No.J20X00526)	Feb-22
Reference Probe EX3DV4	SN 3617	30-Jan-20(SPEAG, No.EX3-3617_Jan20/2)	Jan-21
DAE4	SN 1556	4-Feb-20(SPEAG, No.DAE4-1556_Feb20)	Feb-21

Secondary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
SignalGenerator MG3700A	6201052605	18-Jun-19(CTTL, No.J19X05127)	Jun-20
Network Analyzer E5071C	MY46110673	10-Feb-20(CTTL, No.J20X00515)	Feb-21

	Name	Function	Signature
Calibrated by:	Yu Zongying	SAR Test Engineer	
Reviewed by:	Lin Hao	SAR Test Engineer	
Approved by:	Qi Dianyuan	SAR Project Leader	

Issued: May 22, 2020

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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
CF	crest factor (1/duty_cycle) of the RF signal
A,B,C,D	modulation dependent linearization parameters
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 θ=0 is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013

b) IEC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016

c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010

d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization θ=0 (f≤900MHz in TEM-cell; f>1800MHz: 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.
- PAR: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics.
- *Ax,y,z; Bx,y,z; Cx,y,z; VRx,y,z:*A,B,C are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for f≤800MHz) and inside waveguide using analytical field distributions based on power measurements for f >800MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty valued 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±50MHz to±100MHz.
- *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.
- *Connector Angle:* The angle is assessed using the information gained by determining the *NORMx* (no uncertainty required).

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DASY/EASY – Parameters of Probe: EX3DV4 – SN:3826

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm(μV/(V/m)^2)[A]	0.48	0.41	0.36	±10.0%
DCP(mV)[B]	100.2	99.8	103.2	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB√μV	C	D dB	VR mV	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	160.2	±2.7%
		Y	0.0	0.0	1.0		141.6	
		Z	0.0	0.0	1.0		130.8	

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 Norm X, Y, Z do not affect the E^2-field uncertainty inside TSL (see Page 4).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainly is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

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DASY/EASY – Parameters of Probe: EX3DV4 – SN:3826

Calibration Parameter Determined in Head Tissue Simulating Media

f [MHz][C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha[G]	Depth[G] (mm)	Unct. (*k*=2)
750	41.9	0.89	9.37	9.37	9.37	0.40	0.80	±12.1%
835	41.5	0.90	9.12	9.12	9.12	0.17	1.26	±12.1%
900	41.5	0.97	9.10	9.10	9.10	0.18	1.30	±12.1%
1750	40.1	1.37	7.98	7.98	7.98	0.19	1.14	±12.1%
1900	40.0	1.40	7.67	7.67	7.67	0.22	1.14	±12.1%
2000	40.0	1.40	7.77	7.77	7.77	0.24	1.10	±12.1%
2300	39.5	1.67	7.35	7.35	7.35	0.51	0.73	±12.1%
2450	39.2	1.80	7.12	7.12	7.12	0.53	0.72	±12.1%
2600	39.0	1.96	6.94	6.94	6.94	0.45	0.85	±12.1%
3500	37.9	2.91	6.62	6.62	6.62	0.39	0.98	±13.3%
5250	35.9	4.71	5.09	5.09	5.09	0.45	1.30	±13.3%
5600	35.5	5.07	4.66	4.66	4.66	0.45	1.40	±13.3%
5750	35.4	5.22	4.68	4.68	4.68	0.45	1.40	±13.3%

[C] Frequency validity above 300 MHz of ±100MHz only applies for DASY v4.4 and higher (Page 2), else it is restricted to ±50MHz. The uncertainty is the RSS of ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

[F] At frequency below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ±10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ±5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for the frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

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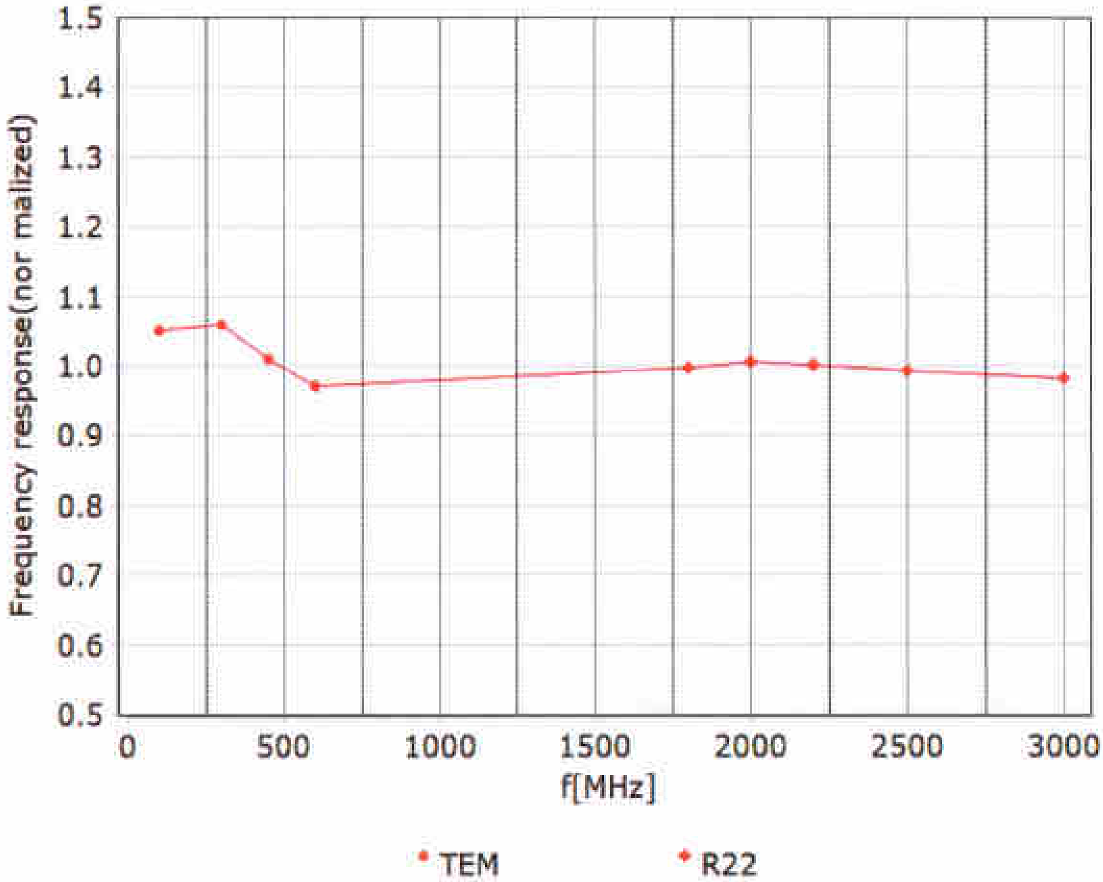
Frequency Response of E-Field
(TEM-Cell: ifi110 EXX, Waveguide: R22)



Uncertainty of Frequency Response of E-field: ±7.4% (*k*=2)

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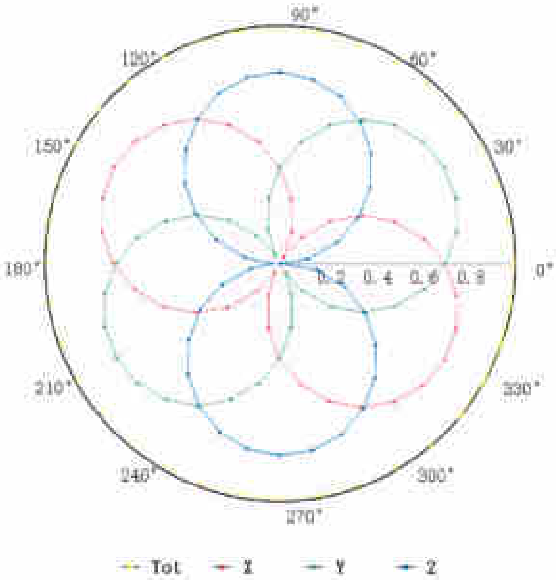
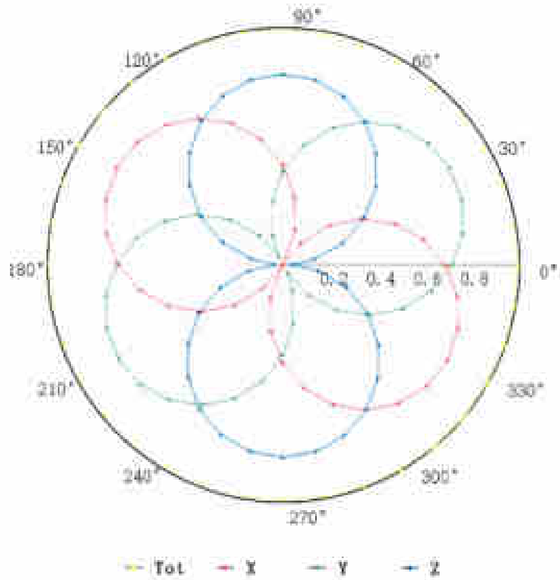
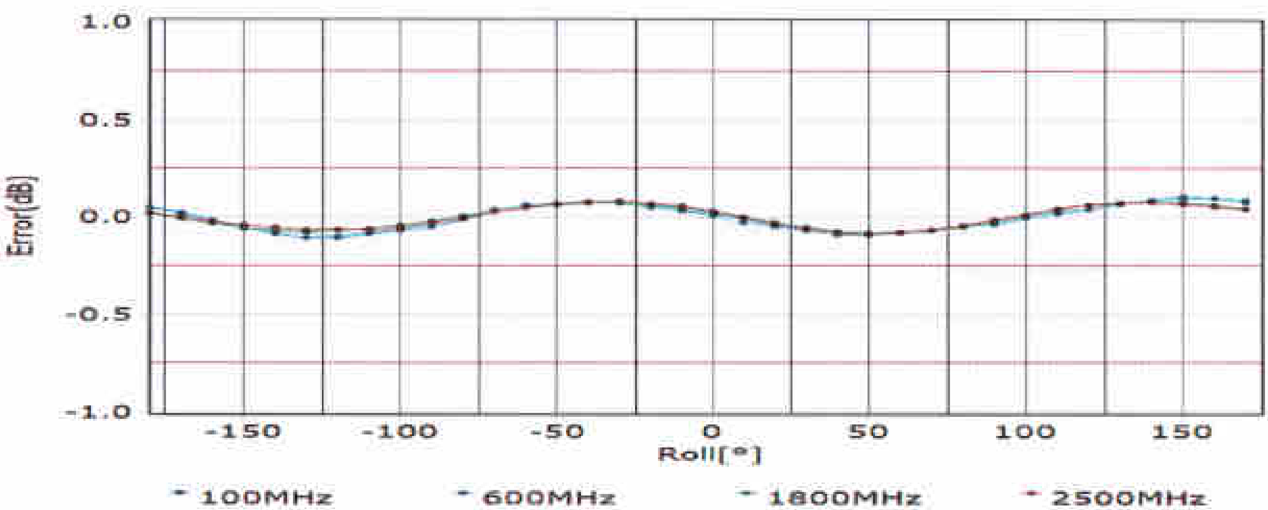
Receiving Pattern (Φ), θ=0°

f=600 MHz, TEM



f=1800 MHz, R22





Uncertainty of Axial Isotropy Assessment: ±1.2% (k=2)

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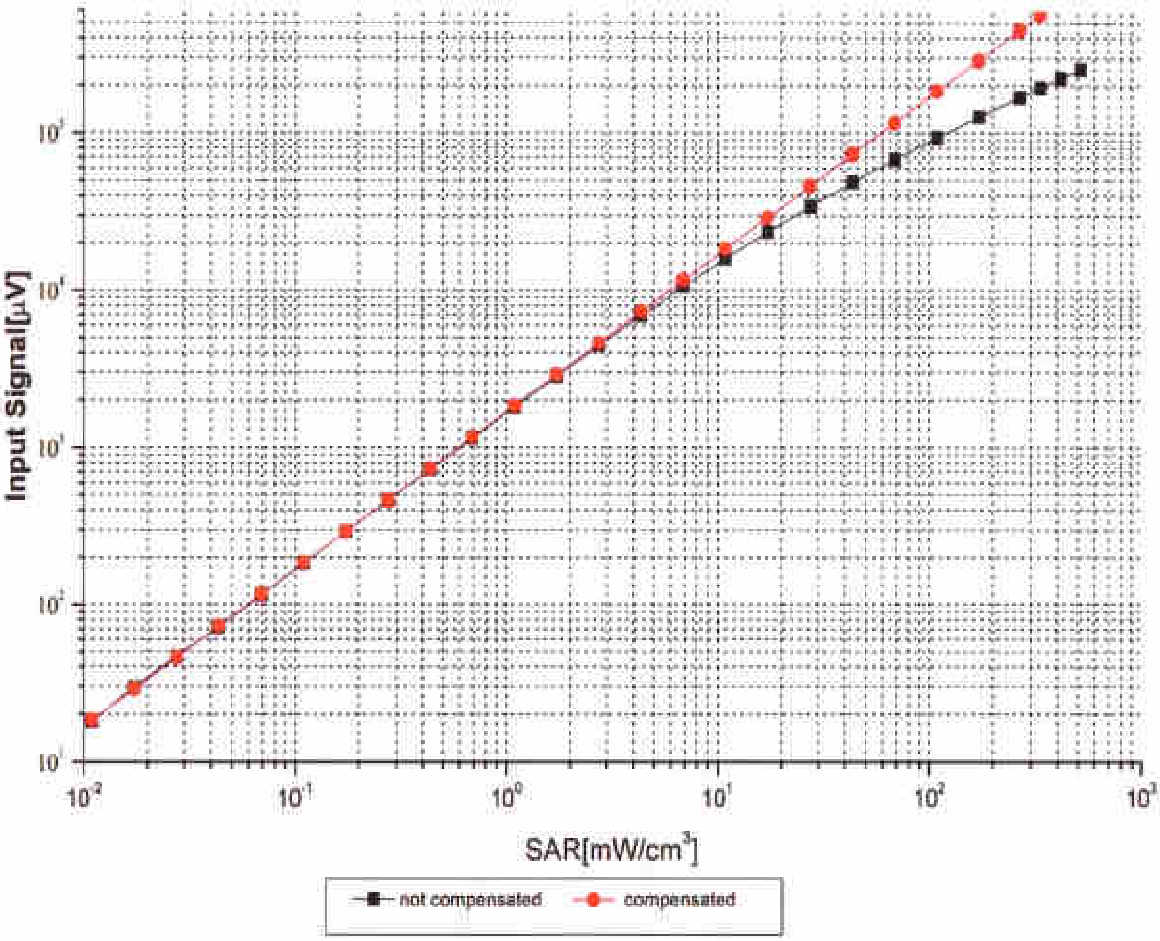
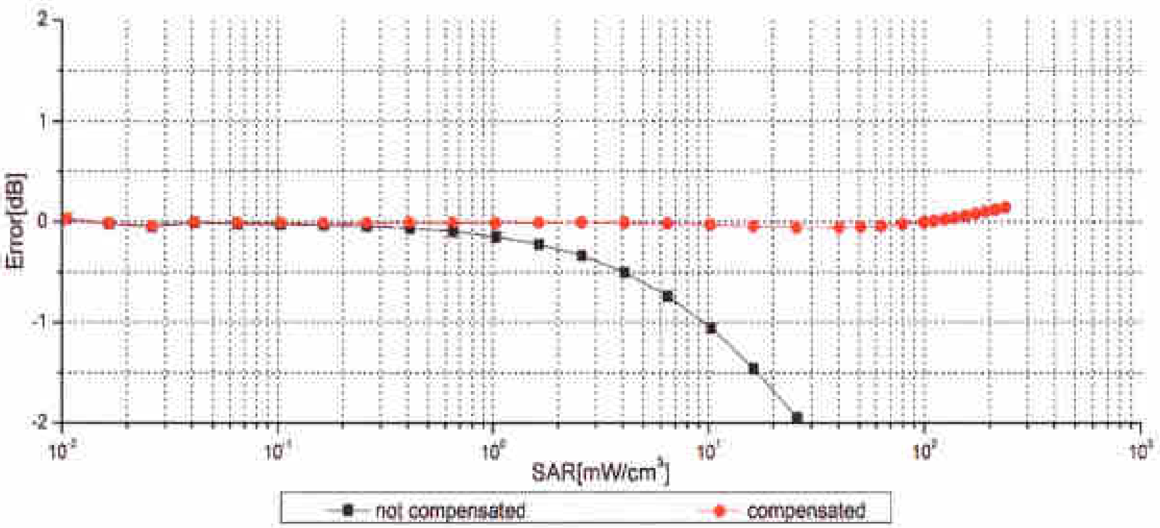
Dynamic Range f(SAR$_{head}$)
(TEM cell, f = 900 MHz)





Uncertainty of Linearity Assessment: ±0.9% (*k*=2)

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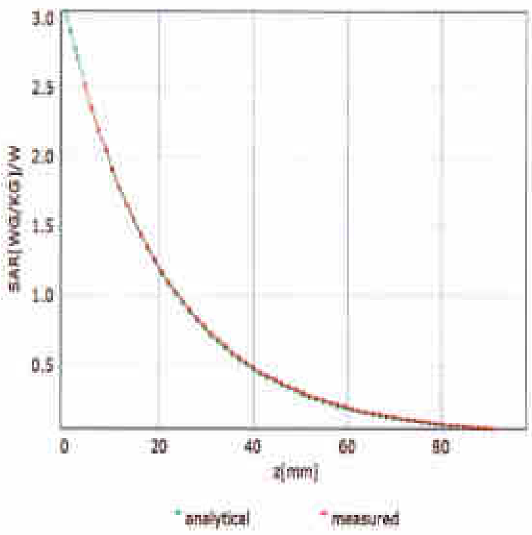
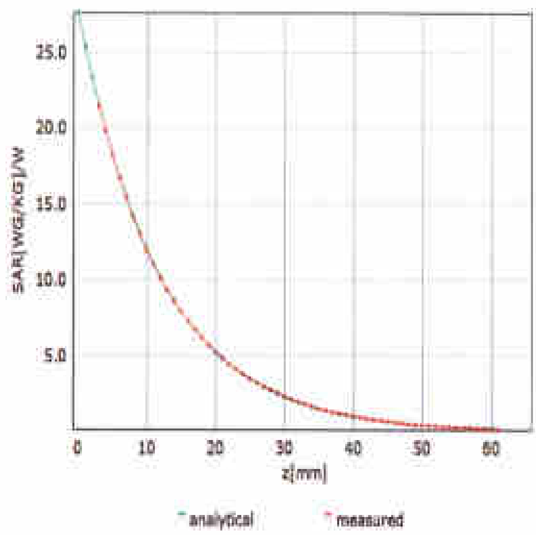
Conversion Factor Assessment

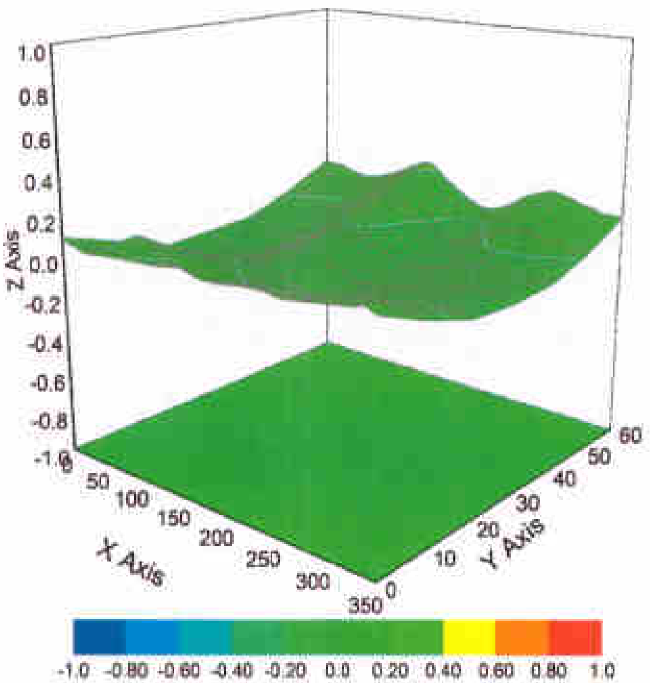
f=750 MHz,WGLS R9(H_convF)



f=1750 MHz,WGLS R22(H_convF)



Deviation from Isotropy in Liquid



Uncertainty of Spherical Isotropy Assessment: ±3.2% (*k*=2)

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DASY/EASY – Parameters of Probe: EX3DV4 – SN:3826

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	51.5
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disable
Probe Overall Length	337mm
Probe Body Diameter	10mm
Tip Length	10mm
Tip Diameter	2.5mm
Probe Tip to Sensor X Calibration Point	1mm
Probe Tip to Sensor Y Calibration Point	1mm
Probe Tip to Sensor Z Calibration Point	1mm
Recommended Measurement Distance from Surface	1.4mm

Appendix E. Conducted RF Output Power Table

The detailed power tables are shown as follows.

Full Power Mode

Band		WCDMA V			Tune-up Limit (dBm)
TX Channel		4132	4182	4233	
Rx Channel		4357	4407	4458	
Frequency (MHz)		826.4	836.4	846.6	
3GPP Rel 99	RMC 12.2Kbps	22.91	23.04	22.98	24.00
3GPP Rel 6	HSDPA Subtest-1	22.12	22.12	21.97	23.00
3GPP Rel 6	HSDPA Subtest-2	22.13	22.09	22.00	23.00
3GPP Rel 6	HSDPA Subtest-3	21.59	21.64	21.51	22.50
3GPP Rel 6	HSDPA Subtest-4	21.60	21.57	21.51	22.50
3GPP Rel 6	HSUPA Subtest-1	22.03	22.10	21.99	23.00
3GPP Rel 6	HSUPA Subtest-2	20.11	20.19	19.94	21.00
3GPP Rel 6	HSUPA Subtest-3	21.08	21.06	20.97	22.00
3GPP Rel 6	HSUPA Subtest-4	20.10	20.12	20.01	21.00
3GPP Rel 6	HSUPA Subtest-5	22.10	22.10	21.90	23.00

Band 5 (Celluar Band)
Part 22H(only on channel required)

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				20450	20525	20600		
Frequency (MHz)				829	836.5	844		
10	QPSK	1	0	22.54	22.35	22.97	24	0
10	QPSK	1	25	22.36	22.73	22.90		
10	QPSK	1	49	22.39	23.07	22.46		
10	QPSK	25	0	21.52	21.60	22.04	23	1
10	QPSK	25	12	21.44	21.70	21.96		
10	QPSK	25	25	21.42	21.88	21.67		
10	QPSK	50	0	21.44	21.70	21.93		
10	16QAM	1	0	21.85	21.62	22.26	23	1
10	16QAM	1	25	21.73	22.03	22.22		
10	16QAM	1	49	21.66	22.39	21.69		
10	16QAM	25	0	20.63	20.70	21.15	22	2
10	16QAM	25	12	20.58	20.79	21.07		
10	16QAM	25	25	20.50	20.93	20.74		
10	16QAM	50	0	20.53	20.81	21.01		
10	64QAM	1	0	20.84	20.55	21.24	22	2
10	64QAM	1	25	20.61	20.95	21.20		
10	64QAM	1	49	20.58	21.33	20.65		
10	64QAM	25	0	19.63	19.72	20.18	21	3
10	64QAM	25	12	19.60	19.83	20.12		
10	64QAM	25	25	19.50	19.95	19.78		
10	64QAM	50	0	19.59	19.80	20.02		
Channel				20425	20525	20625	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				826.5	836.5	846.5		
5	QPSK	1	0	22.54	22.57	22.87	24	0
5	QPSK	1	12	22.50	22.71	22.60		
5	QPSK	1	24	22.42	22.93	22.47		
5	QPSK	12	0	21.62	21.69	21.76	23	1
5	QPSK	12	7	21.58	21.75	21.66		
5	QPSK	12	13	21.54	21.85	21.51		
5	QPSK	25	0	21.50	21.72	21.66		
5	16QAM	1	0	21.91	21.83	22.16	23	1
5	16QAM	1	12	21.85	22.02	21.89		
5	16QAM	1	24	21.77	22.23	21.63		
5	16QAM	12	0	20.76	20.74	20.85	22	2
5	16QAM	12	7	20.67	20.82	20.75		
5	16QAM	12	13	20.64	20.91	20.59		
5	16QAM	25	0	20.64	20.77	20.74		
5	64QAM	1	0	20.81	20.82	21.13	22	2
5	64QAM	1	12	20.79	20.95	20.90		
5	64QAM	1	24	20.74	21.18	20.66		
5	64QAM	12	0	19.80	19.80	19.95	21	3
5	64QAM	12	7	19.74	19.85	19.81		
5	64QAM	12	13	19.72	19.93	19.65		
5	64QAM	25	0	19.65	19.81	19.78		
Channel				20415	20525	20635	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				825.5	836.5	847.5		
3	QPSK	1	0	22.54	22.63	22.66	24	0
3	QPSK	1	8	22.57	22.72	22.51		
3	QPSK	1	14	22.47	22.79	22.49		
3	QPSK	8	0	21.65	21.65	21.59	23	1
3	QPSK	8	4	21.66	21.74	21.64		
3	QPSK	8	7	21.60	21.82	21.52		
3	QPSK	15	0	21.63	21.70	21.55		
3	16QAM	1	0	21.88	21.88	21.86	23	1
3	16QAM	1	8	21.99	21.99	21.72		
3	16QAM	1	14	21.80	22.03	21.65		
3	16QAM	8	0	20.83	20.77	20.70	22	2
3	16QAM	8	4	20.85	20.84	20.72		
3	16QAM	8	7	20.72	20.92	20.62		
3	16QAM	15	0	20.72	20.80	20.62		
3	64QAM	1	0	20.81	20.84	20.86	22	2
3	64QAM	1	8	20.93	20.95	20.73		
3	64QAM	1	14	20.76	20.98	20.65		
3	64QAM	8	0	19.81	19.80	19.73	21	3
3	64QAM	8	4	19.84	19.83	19.76		
3	64QAM	8	7	19.74	19.94	19.66		
3	64QAM	15	0	19.74	19.77	19.64		
Channel				20407	20525	20643	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				824.7	836.5	848.3		
1.4	QPSK	1	0	22.49	22.59	22.44	24	0
1.4	QPSK	1	3	22.59	22.71	22.52		
1.4	QPSK	1	5	22.49	22.66	22.42		
1.4	QPSK	3	0	22.54	22.61	22.51		
1.4	QPSK	3	1	22.57	22.68	22.57		
1.4	QPSK	3	3	22.54	22.71	22.50		
1.4	QPSK	6	0	21.48	21.64	21.53	23	1
1.4	16QAM	1	0	21.84	21.87	21.69	23	1
1.4	16QAM	1	3	21.94	21.94	21.69		
1.4	16QAM	1	5	21.81	21.93	21.59		
1.4	16QAM	3	0	21.64	21.66	21.50		
1.4	16QAM	3	1	21.65	21.70	21.53		
1.4	16QAM	3	3	21.63	21.72	21.48		
1.4	16QAM	6	0	20.66	20.78	20.63	22	2
1.4	64QAM	1	0	20.79	20.79	20.67	22	2
1.4	64QAM	1	3	20.84	20.99	20.70		
1.4	64QAM	1	5	20.81	20.93	20.59		
1.4	64QAM	3	0	20.75	20.85	20.69		
1.4	64QAM	3	1	20.83	20.87	20.71		
1.4	64QAM	3	3	20.77	20.89	20.66		
1.4	64QAM	6	0	19.60	19.75	19.57	21	3

Band 38(only on channel required)

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				37850	38000	38150		
Frequency (MHz)				2580	2595	2610		
20	QPSK	1	0	23.01	22.85	23.07	24	0
20	QPSK	1	49	23.12	23.14	23.37		
20	QPSK	1	99	23.58	23.08	23.33		
20	QPSK	50	0	22.43	22.30	22.33	23	1
20	QPSK	50	24	22.27	22.29	22.35		
20	QPSK	50	50	22.24	22.18	22.33		
20	QPSK	100	0	22.44	22.14	22.38		
20	16QAM	1	0	22.06	21.98	22.42	23	1
20	16QAM	1	49	22.36	22.28	22.53		
20	16QAM	1	99	22.51	22.21	22.49		
20	16QAM	50	0	21.23	21.38	21.43	22	2
20	16QAM	50	24	21.36	21.28	21.45		
20	16QAM	50	50	21.52	21.40	21.55		
20	16QAM	100	0	21.32	21.23	21.49		
20	64QAM	1	0	20.98	20.90	20.96	22	2
20	64QAM	1	49	21.09	21.12	21.28		
20	64QAM	1	99	21.03	21.16	21.26		
20	64QAM	50	0	20.29	20.23	20.40	21	3
20	64QAM	50	24	20.32	20.36	20.43		
20	64QAM	50	50	20.49	20.37	20.63		
20	64QAM	100	0	20.28	20.31	20.38		
Channel				37825	38000	38175	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2577.5	2595	2612.5		
15	QPSK	1	0	23.10	23.14	23.35	24	0
15	QPSK	1	37	23.28	23.23	23.34		
15	QPSK	1	74	23.36	23.27	23.54		
15	QPSK	36	0	22.14	22.15	22.37	23	1
15	QPSK	36	20	22.23	22.22	22.46		
15	QPSK	36	39	22.17	22.25	22.46		
15	QPSK	75	0	22.29	22.09	22.42		
15	16QAM	1	0	22.11	22.24	22.46	23	1
15	16QAM	1	37	22.37	22.31	22.54		
15	16QAM	1	74	22.51	22.38	22.67		
15	16QAM	36	0	21.31	21.26	21.40	22	2
15	16QAM	36	20	21.32	21.26	21.51		
15	16QAM	36	39	21.37	21.30	21.53		
15	16QAM	75	0	21.34	21.29	21.43		
15	64QAM	1	0	20.79	20.96	20.99	22	2
15	64QAM	1	37	21.16	21.02	21.39		
15	64QAM	1	74	21.31	21.22	21.23		
15	64QAM	36	0	20.29	20.26	20.42	21	3
15	64QAM	36	20	20.40	20.26	20.53		
15	64QAM	36	39	20.35	20.30	20.56		
15	64QAM	75	0	20.39	20.25	20.41		
Channel				37800	38000	38200	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2575	2595	2615		
10	QPSK	1	0	22.99	23.17	23.27	24	0
10	QPSK	1	25	23.13	23.06	23.39		
10	QPSK	1	49	23.18	23.05	23.39		
10	QPSK	25	0	22.14	22.16	22.35	23	1
10	QPSK	25	12	22.16	22.18	22.50		
10	QPSK	25	25	22.19	22.22	22.52		
10	QPSK	50	0	22.33	22.26	22.45		
10	16QAM	1	0	22.26	22.30	22.52	23	1
10	16QAM	1	25	22.32	22.18	22.55		
10	16QAM	1	49	22.41	22.25	22.63		
10	16QAM	25	0	21.22	21.27	21.47	22	2
10	16QAM	25	12	21.33	21.29	21.63		
10	16QAM	25	25	21.36	21.22	21.65		
10	16QAM	50	0	21.39	21.25	21.67		
10	64QAM	1	0	20.82	20.92	21.16	22	2
10	64QAM	1	25	21.01	21.00	21.31		
10	64QAM	1	49	21.21	21.15	21.41		
10	64QAM	25	0	20.30	20.30	20.60	21	3
10	64QAM	25	12	20.41	20.33	20.66		
10	64QAM	25	25	20.44	20.38	20.69		
10	64QAM	50	0	20.32	20.36	20.56		
Channel				37775	38000	38225	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2572.5	2595	2617.5		
5	QPSK	1	0	23.15	22.98	23.48	24	0
5	QPSK	1	12	23.11	23.08	23.46		
5	QPSK	1	24	23.10	22.99	23.38		
5	QPSK	12	0	22.14	22.13	22.43	23	1
5	QPSK	12	7	22.16	22.16	22.60		
5	QPSK	12	13	22.19	22.20	22.50		
5	QPSK	25	0	22.07	22.19	22.54		
5	16QAM	1	0	22.09	22.19	22.41	23	1
5	16QAM	1	12	22.31	22.32	22.63		
5	16QAM	1	24	22.33	22.17	22.47		
5	16QAM	12	0	21.16	21.19	21.61	22	2
5	16QAM	12	7	21.30	21.33	21.59		
5	16QAM	12	13	21.23	21.27	21.58		
5	16QAM	25	0	21.29	21.32	21.59		
5	64QAM	1	0	21.01	21.04	21.29	22	2
5	64QAM	1	12	20.99	20.94	21.40		
5	64QAM	1	24	21.05	21.11	21.25		
5	64QAM	12	0	20.18	20.24	20.67	21	3
5	64QAM	12	7	20.31	20.28	20.64		
5	64QAM	12	13	20.35	20.33	20.63		
5	64QAM	25	0	20.29	20.35	20.62		

Band 41 (2.6G Band)

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Low Ch. / Freq.	Power Middle High Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				40140	40400	40670	41140		
Frequency (MHz)				2545	2571	2598	2645		
20	QPSK	1	0	23.11	23.11	23.51	23.19	24	0
20	QPSK	1	49	23.14	23.37	23.56	23.06		
20	QPSK	1	99	23.09	23.48	23.65	23.11		
20	QPSK	50	0	22.46	22.57	22.81	22.55	23	1
20	QPSK	50	24	22.54	22.66	22.97	22.67		
20	QPSK	50	50	22.46	22.71	22.81	22.24		
20	QPSK	100	0	22.51	22.64	22.80	22.27		
20	16QAM	1	0	22.12	22.16	22.64	22.05	23	1
20	16QAM	1	49	22.23	22.54	22.70	22.17		
20	16QAM	1	99	22.08	22.62	22.81	21.51		
20	16QAM	50	0	21.24	21.52	21.68	21.91	22	2
20	16QAM	50	24	21.35	21.65	21.73	22.00		
20	16QAM	50	50	21.41	21.59	21.75	21.98		
20	16QAM	100	0	21.35	21.51	21.72	21.93		
20	64QAM	1	0	20.90	20.81	21.24	20.10	22	2
20	64QAM	1	49	21.02	21.16	21.42	20.81		
20	64QAM	1	99	21.16	21.24	21.13	20.01		
20	64QAM	50	0	20.23	20.33	20.49	20.61	21	3
20	64QAM	50	24	20.44	20.39	20.58	20.73		
20	64QAM	50	50	20.53	20.42	20.64	20.61		
20	64QAM	100	0	20.43	20.38	20.57	20.71		
Channel				40115	40395	40685	41165	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2542.5	2570.5	2599.5	2647.5		
15	QPSK	1	0	23.12	23.32	23.56	22.62	24	0
15	QPSK	1	37	23.15	23.45	23.64	23.17		
15	QPSK	1	74	23.31	23.49	23.25	22.75		
15	QPSK	36	0	22.16	22.43	22.65	22.90	23	1
15	QPSK	36	20	22.30	22.49	22.70	22.92		
15	QPSK	36	39	22.30	22.51	22.67	22.87		
15	QPSK	75	0	22.30	22.53	22.64	22.89		
15	16QAM	1	0	22.21	22.36	22.63	21.63	23	1
15	16QAM	1	37	22.31	22.53	22.75	22.27		
15	16QAM	1	74	22.46	22.65	22.86	21.85		
15	16QAM	36	0	21.18	21.48	21.61	21.88	22	2
15	16QAM	36	20	21.34	21.57	21.70	21.92		
15	16QAM	36	39	21.37	21.58	21.70	21.95		
15	16QAM	75	0	21.36	21.59	21.72	21.96		
15	64QAM	1	0	20.99	20.89	21.19	20.11	22	2
15	64QAM	1	37	21.09	21.19	21.17	20.71		
15	64QAM	1	74	21.26	21.24	21.36	20.18		
15	64QAM	36	0	20.23	20.30	20.57	20.63	21	3
15	64QAM	36	20	20.41	20.33	20.65	20.65		
15	64QAM	36	39	20.38	20.34	20.56	20.66		
15	64QAM	75	0	20.43	20.34	20.59	20.67		
Channel				40090	40390	40690	41190	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2540	2570	2600	2650		
10	QPSK	1	0	23.07	23.40	23.53	22.95	24	0
10	QPSK	1	25	23.14	23.45	23.61	23.17		
10	QPSK	1	49	23.20	23.48	23.63	23.08		
10	QPSK	25	0	22.18	22.45	22.57	22.86	23	1
10	QPSK	25	12	22.16	22.49	22.66	22.91		
10	QPSK	25	25	22.19	22.51	22.67	22.88		
10	QPSK	50	0	22.21	22.52	22.72	22.89		
10	16QAM	1	0	22.19	22.52	22.68	21.98	23	1
10	16QAM	1	25	22.25	22.50	22.71	22.27		
10	16QAM	1	49	22.28	22.58	22.77	22.16		
10	16QAM	25	0	21.24	21.54	21.69	21.93	22	2
10	16QAM	25	12	21.29	21.55	21.77	21.93		
10	16QAM	25	25	21.26	21.58	21.73	21.98		
10	16QAM	50	0	21.28	21.53	21.74	21.97		
10	64QAM	1	0	20.94	21.08	21.40	20.41	22	2
10	64QAM	1	25	20.99	21.12	21.43	20.65		
10	64QAM	1	49	21.08	21.18	21.28	20.49		
10	64QAM	25	0	20.27	20.38	20.60	20.67	21	3
10	64QAM	25	12	20.29	20.34	20.68	20.78		
10	64QAM	25	25	20.26	20.45	20.62	20.72		
10	64QAM	50	0	20.27	20.33	20.57	20.66		
Channel				40065	40385	40705	41215	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2537.5	2569.5	2601.5	2652.5		
5	QPSK	1	0	23.12	23.37	23.61	23.59	24	0
5	QPSK	1	12	23.13	23.42	23.57	23.56		
5	QPSK	1	24	23.12	23.41	23.62	23.59		
5	QPSK	12	0	22.12	22.46	22.63	22.63	23	1
5	QPSK	12	7	22.19	22.48	22.67	22.67		
5	QPSK	12	13	22.17	22.46	22.71	22.69		
5	QPSK	25	0	22.14	22.48	22.65	22.67		
5	16QAM	1	0	22.16	22.50	22.66	22.65	23	1
5	16QAM	1	12	22.24	22.58	22.78	22.76		
5	16QAM	1	24	22.24	22.57	22.75	22.76		
5	16QAM	12	0	21.20	21.48	21.67	21.67	22	2
5	16QAM	12	7	21.25	21.51	21.71	21.73		
5	16QAM	12	13	21.21	21.49	21.70	21.70		
5	16QAM	25	0	21.27	21.56	21.77	21.75		
5	64QAM	1	0	20.99	21.04	21.17	20.84	22	2
5	64QAM	1	12	20.99	21.09	21.26	20.66		
5	64QAM	1	24	20.87	21.11	21.35	20.93		
5	64QAM	12	0	20.13	20.34	20.53	20.62	21	3
5	64QAM	12	7	20.21	20.34	20.61	20.70		
5	64QAM	12	13	20.28	20.35	20.58	20.67		
5	64QAM	25	0	20.26	20.39	20.58	20.66		

Reduced Power Mode for Sensor On

Band		WCDMA V			Tune-up Limit (dBm)
TX Channel		4132	4182	4233	
Rx Channel		4357	4407	4458	
Frequency (MHz)		826.4	836.4	846.6	
3GPP Rel 99	RMC 12.2Kbps	14.69	14.72	14.63	15.50
3GPP Rel 6	HSDPA Subtest-1	13.58	13.61	13.51	14.50
3GPP Rel 6	HSDPA Subtest-2	13.60	13.66	13.57	14.50
3GPP Rel 6	HSDPA Subtest-3	13.15	13.20	13.04	14.00
3GPP Rel 6	HSDPA Subtest-4	13.11	13.19	13.05	14.00
3GPP Rel 6	HSUPA Subtest-1	13.64	13.70	13.67	14.50
3GPP Rel 6	HSUPA Subtest-2	11.64	11.69	11.56	12.50
3GPP Rel 6	HSUPA Subtest-3	12.07	12.04	11.96	13.50
3GPP Rel 6	HSUPA Subtest-4	11.63	11.68	11.56	12.50
3GPP Rel 6	HSUPA Subtest-5	13.65	13.75	13.63	14.50

Band 5 (Celluar Band) Part 22H(only on channel required)								
BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				20450	20525	20600		
Frequency (MHz)				829	836.5	844		
10	QPSK	1	0	15.25	15.05	15.10	16.5	0
10	QPSK	1	25	15.14	15.47	15.05		
10	QPSK	1	49	15.28	15.72	15.19		
10	QPSK	25	0	15.22	15.60	15.40	16.5	0
10	QPSK	25	12	15.16	15.39	15.33		
10	QPSK	25	25	15.12	15.58	15.26		
10	QPSK	50	0	15.17	15.59	15.44		
10	16QAM	1	0	15.15	14.99	15.66	16.5	0
10	16QAM	1	25	15.07	15.38	15.60		
10	16QAM	1	49	15.03	15.59	15.14		
10	16QAM	25	0	14.94	15.01	15.45	16.5	0
10	16QAM	25	12	14.91	15.12	15.40		
10	16QAM	25	25	14.83	15.26	15.12		
10	16QAM	50	0	14.91	15.08	15.31		
10	64QAM	1	0	15.14	14.95	15.59	16.5	0
10	64QAM	1	25	15.06	15.33	15.55		
10	64QAM	1	49	15.01	15.63	15.12		
10	64QAM	25	0	14.92	15.04	15.47	16.5	0
10	64QAM	25	12	14.89	15.11	15.41		
10	64QAM	25	25	14.86	15.29	15.13		
10	64QAM	50	0	14.90	15.13	15.32		
Channel				20425	20525	20625	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				826.5	836.5	846.5		
5	QPSK	1	0	14.84	14.87	15.19	16.5	0
5	QPSK	1	12	14.81	15.06	14.96		
5	QPSK	1	24	14.76	15.24	14.82		
5	QPSK	12	0	14.92	14.94	15.10	16.5	0
5	QPSK	12	7	14.89	15.03	15.04		
5	QPSK	12	13	14.88	15.12	14.88		
5	QPSK	25	0	14.83	15.02	15.03		
5	16QAM	1	0	15.18	15.23	15.62	16.5	0
5	16QAM	1	12	15.20	15.44	15.34		
5	16QAM	1	24	15.18	15.59	15.14		
5	16QAM	12	0	15.03	15.05	15.19	16.5	0
5	16QAM	12	7	14.98	15.10	15.14		
5	16QAM	12	13	14.94	15.25	14.99		
5	16QAM	25	0	14.93	15.11	15.13		
5	64QAM	1	0	15.13	15.19	15.49	16.5	0
5	64QAM	1	12	15.10	15.36	15.29		
5	64QAM	1	24	15.04	15.54	15.09		
5	64QAM	12	0	15.10	15.13	15.23	16.5	0
5	64QAM	12	7	15.04	15.20	15.18		
5	64QAM	12	13	15.03	15.28	15.01		
5	64QAM	25	0	14.98	15.12	15.13		
Channel				20415	20525	20635	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				825.5	836.5	847.5		
3	QPSK	1	0	14.82	14.95	15.03	16.5	0
3	QPSK	1	8	14.93	15.07	14.87		
3	QPSK	1	14	14.78	15.13	14.83		
3	QPSK	8	0	14.96	14.97	14.98	16.5	0
3	QPSK	8	4	15.00	15.05	14.98		
3	QPSK	8	7	14.87	15.13	14.90		
3	QPSK	15	0	14.90	15.01	14.88		
3	16QAM	1	0	15.21	15.32	15.34	16.5	0
3	16QAM	1	8	15.30	15.41	15.19		
3	16QAM	1	14	15.14	15.45	15.15		
3	16QAM	8	0	15.10	15.11	15.11	16.5	0
3	16QAM	8	4	15.10	15.15	15.10		
3	16QAM	8	7	15.05	15.23	15.03		
3	16QAM	15	0	15.04	15.13	14.98		
3	64QAM	1	0	15.08	15.22	15.28	16.5	0
3	64QAM	1	8	15.20	15.35	15.14		
3	64QAM	1	14	15.08	15.41	15.11		
3	64QAM	8	0	15.15	15.12	15.11	16.5	0
3	64QAM	8	4	15.12	15.17	15.11		
3	64QAM	8	7	15.04	15.27	15.04		
3	64QAM	15	0	15.03	15.14	15.00		
Channel				20407	20525	20643	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				824.7	836.5	848.3		
1.4	QPSK	1	0	14.80	14.93	14.81	16.5	0
1.4	QPSK	1	3	14.79	14.93	14.80		
1.4	QPSK	1	5	14.78	14.93	14.80		
1.4	QPSK	3	0	14.86	14.96	14.82		
1.4	QPSK	3	1	14.86	14.96	14.83		
1.4	QPSK	3	3	14.86	14.95	14.83		
1.4	QPSK	6	0	14.85	14.96	14.84	16.5	0
1.4	16QAM	1	0	15.09	15.24	15.12	16.5	0
1.4	16QAM	1	3	15.10	15.21	15.11		
1.4	16QAM	1	5	15.11	15.25	15.11		
1.4	16QAM	3	0	14.98	15.08	14.96		
1.4	16QAM	3	1	14.97	15.08	14.96		
1.4	16QAM	3	3	14.97	15.08	14.96		
1.4	16QAM	6	0	14.97	15.07	14.96	16.5	0
1.4	64QAM	1	0	15.09	15.20	15.09	16.5	0
1.4	64QAM	1	3	15.08	15.20	15.08		
1.4	64QAM	1	5	15.08	15.21	15.11		
1.4	64QAM	3	0	14.94	15.09	14.96		
1.4	64QAM	3	1	14.94	15.08	14.95		
1.4	64QAM	3	3	14.94	15.08	14.95		
1.4	64QAM	6	0	14.94	15.08	14.95	16.5	0

Band 38(only on channel required)

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				37850	38000	38150		
Frequency (MHz)				2580	2595	2610		
20	QPSK	1	0	11.66	11.48	11.41	12.5	0
20	QPSK	1	49	11.60	11.47	11.60		
20	QPSK	1	99	11.91	11.65	11.74		
20	QPSK	50	0	11.87	11.63	11.73	12.5	0
20	QPSK	50	24	11.61	11.47	11.67		
20	QPSK	50	50	11.69	11.48	11.54		
20	QPSK	100	0	11.79	11.61	11.72		
20	16QAM	1	0	11.77	11.48	11.63	12.5	0
20	16QAM	1	49	11.81	11.68	11.77		
20	16QAM	1	99	11.76	11.71	11.90		
20	16QAM	50	0	11.73	11.53	11.57	12.5	0
20	16QAM	50	24	11.77	11.63	11.59		
20	16QAM	50	50	11.80	11.53	11.76		
20	16QAM	100	0	11.70	11.57	11.54		
20	64QAM	1	0	11.25	11.18	11.33	12.5	0
20	64QAM	1	49	11.63	11.37	11.46		
20	64QAM	1	99	11.46	11.47	11.41		
20	64QAM	50	0	11.60	11.49	11.65	12.5	0
20	64QAM	50	24	11.75	11.61	11.57		
20	64QAM	50	50	11.76	11.61	11.73		
20	64QAM	100	0	11.68	11.66	11.62		
Channel				37825	38000	38175	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2577.5	2595	2612.5		
15	QPSK	1	0	11.37	11.59	11.49	12.5	0
15	QPSK	1	37	11.48	11.64	11.76		
15	QPSK	1	74	11.77	11.63	11.80		
15	QPSK	36	0	11.58	11.46	11.63	12.5	0
15	QPSK	36	20	11.70	11.54	11.76		
15	QPSK	36	39	11.66	11.57	11.82		
15	QPSK	75	0	11.57	11.51	11.62		
15	16QAM	1	0	11.60	11.60	11.60	12.5	0
15	16QAM	1	37	11.70	11.65	11.78		
15	16QAM	1	74	11.75	11.74	11.89		
15	16QAM	36	0	11.47	11.33	11.52	12.5	0
15	16QAM	36	20	11.49	11.43	11.66		
15	16QAM	36	39	11.55	11.47	11.72		
15	16QAM	75	0	11.61	11.44	11.67		
15	64QAM	1	0	11.26	11.29	11.30	12.5	0
15	64QAM	1	37	11.39	11.33	11.46		
15	64QAM	1	74	11.34	11.26	11.71		
15	64QAM	36	0	11.48	11.46	11.55	12.5	0
15	64QAM	36	20	11.50	11.57	11.69		
15	64QAM	36	39	11.56	11.48	11.75		
15	64QAM	75	0	11.47	11.54	11.65		
Channel				37800	38000	38200	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2575	2595	2615		
10	QPSK	1	0	11.48	11.50	11.82	12.5	0
10	QPSK	1	25	11.47	11.59	11.81		
10	QPSK	1	49	11.54	11.60	11.90		
10	QPSK	25	0	11.49	11.50	11.78	12.5	0
10	QPSK	25	12	11.62	11.51	11.85		
10	QPSK	25	25	11.66	11.54	11.81		
10	QPSK	50	0	11.69	11.47	11.90		
10	16QAM	1	0	11.37	11.52	11.84	12.5	0
10	16QAM	1	25	11.58	11.59	11.82		
10	16QAM	1	49	11.49	11.45	11.87		
10	16QAM	25	0	11.45	11.46	11.74	12.5	0
10	16QAM	25	12	11.57	11.46	11.81		
10	16QAM	25	25	11.49	11.49	11.77		
10	16QAM	50	0	11.62	11.51	11.84		
10	64QAM	1	0	11.18	11.11	11.53	12.5	0
10	64QAM	1	25	11.28	11.18	11.51		
10	64QAM	1	49	11.41	11.27	11.59		
10	64QAM	25	0	11.58	11.49	11.76	12.5	0
10	64QAM	25	12	11.60	11.50	11.84		
10	64QAM	25	25	11.63	11.52	11.89		
10	64QAM	50	0	11.49	11.50	11.71		
Channel				37775	38000	38225	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2572.5	2595	2617.5		
5	QPSK	1	0	11.40	11.50	11.71	12.5	0
5	QPSK	1	12	11.52	11.44	11.83		
5	QPSK	1	24	11.53	11.46	11.77		
5	QPSK	12	0	11.57	11.50	11.83	12.5	0
5	QPSK	12	7	11.49	11.52	11.80		
5	QPSK	12	13	11.54	11.58	11.90		
5	QPSK	25	0	11.51	11.56	11.84		
5	16QAM	1	0	11.48	11.43	11.68	12.5	0
5	16QAM	1	12	11.52	11.43	11.84		
5	16QAM	1	24	11.56	11.49	11.82		
5	16QAM	12	0	11.47	11.40	11.73	12.5	0
5	16QAM	12	7	11.50	11.53	11.82		
5	16QAM	12	13	11.44	11.47	11.83		
5	16QAM	25	0	11.48	11.50	11.80		
5	64QAM	1	0	11.21	11.15	11.51	12.5	0
5	64QAM	1	12	11.22	11.35	11.53		
5	64QAM	1	24	11.28	11.31	11.52		
5	64QAM	12	0	11.51	11.45	11.77	12.5	0
5	64QAM	12	7	11.55	11.46	11.86		
5	64QAM	12	13	11.49	11.51	11.86		
5	64QAM	25	0	11.49	11.53	11.82		

Band 41 (2.6G Band)

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Low Ch. / Freq.	Power Middle High Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				40140	40400	40670	41140		
Frequency (MHz)				2545	2571	2598	2645		
20	QPSK	1	0	11.42	11.58	11.60	11.48	12.5	0
20	QPSK	1	49	11.31	11.57	11.75	11.39		
20	QPSK	1	99	11.61	11.62	11.94	11.55		
20	QPSK	50	0	11.56	11.60	11.85	11.50	12.5	0
20	QPSK	50	24	11.33	11.60	11.75	11.49		
20	QPSK	50	50	11.5	11.59	11.75	11.47		
20	QPSK	100	0	11.53	11.56	11.78	11.47		
20	16QAM	1	0	11.71	11.78	11.75	11.80	12.5	0
20	16QAM	1	49	11.66	11.91	11.79	11.76		
20	16QAM	1	99	11.78	11.86	11.79	11.87		
20	16QAM	50	0	11.57	11.64	11.75	11.62	12.5	0
20	16QAM	50	24	11.57	11.80	11.89	11.53		
20	16QAM	50	50	11.61	11.72	11.90	11.62		
20	16QAM	100	0	11.57	11.66	11.75	11.60		
20	64QAM	1	0	11.37	11.23	11.36	11.49	12.5	0
20	64QAM	1	49	11.11	11.25	11.48	11.55		
20	64QAM	1	99	11.34	11.74	11.41	11.56		
20	64QAM	50	0	11.43	11.74	11.77	11.49	12.5	0
20	64QAM	50	24	11.67	11.67	11.79	11.63		
20	64QAM	50	50	11.59	11.82	11.71	11.60		
20	64QAM	100	0	11.45	11.65	11.76	11.59		
Channel				40115	40395	40685	41165	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2542.5	2570.5	2599.5	2647.5		
15	QPSK	1	0	11.04	11.59	11.80	11.59	12.5	0
15	QPSK	1	37	11.05	11.38	11.81	11.59		
15	QPSK	1	74	11.34	11.86	11.53	11.72		
15	QPSK	36	0	11.24	11.63	11.72	11.47	12.5	0
15	QPSK	36	20	11.42	11.60	11.74	11.57		
15	QPSK	36	39	11.31	11.62	11.65	11.43		
15	QPSK	75	0	11.33	11.65	11.62	11.46		
15	16QAM	1	0	11.33	11.79	11.85	11.78	12.5	0
15	16QAM	1	37	11.62	11.93	11.63	11.81		
15	16QAM	1	74	11.87	11.69	11.83	11.56		
15	16QAM	36	0	11.31	11.58	11.78	11.57	12.5	0
15	16QAM	36	20	11.50	11.72	11.72	11.57		
15	16QAM	36	39	11.51	11.63	11.75	11.66		
15	16QAM	75	0	11.46	11.65	11.77	11.61		
15	64QAM	1	0	11.23	11.48	11.72	11.47	12.5	0
15	64QAM	1	37	11.32	11.66	11.81	11.27		
15	64QAM	1	74	11.55	11.85	11.77	11.25		
15	64QAM	36	0	11.34	11.63	11.74	11.59	12.5	0
15	64QAM	36	20	11.41	11.76	11.70	11.58		
15	64QAM	36	39	11.53	11.78	11.72	11.56		
15	64QAM	75	0	11.55	11.64	11.78	11.58		
Channel				40090	40390	40690	41190	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2540	2570	2600	2650		
10	QPSK	1	0	11.20	11.42	11.69	11.58	12.5	0
10	QPSK	1	25	11.32	11.46	11.51	11.60		
10	QPSK	1	49	11.48	11.67	11.80	11.64		
10	QPSK	25	0	11.36	11.50	11.62	11.54	12.5	0
10	QPSK	25	12	11.41	11.57	11.74	11.59		
10	QPSK	25	25	11.41	11.58	11.66	11.68		
10	QPSK	50	0	11.43	11.61	11.64	11.62		
10	16QAM	1	0	11.40	11.66	11.74	11.68	12.5	0
10	16QAM	1	25	11.53	11.80	11.73	11.82		
10	16QAM	1	49	11.62	11.73	11.83	11.82		
10	16QAM	25	0	11.44	11.70	11.77	11.73	12.5	0
10	16QAM	25	12	11.49	11.65	11.90	11.78		
10	16QAM	25	25	11.59	11.77	11.82	11.75		
10	16QAM	50	0	11.49	11.66	11.78	11.65		
10	64QAM	1	0	11.34	11.48	11.61	11.38	12.5	0
10	64QAM	1	25	11.35	11.50	11.67	11.38		
10	64QAM	1	49	11.42	11.55	11.68	11.63		
10	64QAM	25	0	11.48	11.73	11.85	11.74	12.5	0
10	64QAM	25	12	11.54	11.80	11.85	11.80		
10	64QAM	25	25	11.52	11.80	11.88	11.77		
10	64QAM	50	0	11.60	11.63	11.71	11.74		
Channel				40065	40385	40705	41215	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2537.5	2569.5	2601.5	2652.5		
5	QPSK	1	0	11.15	11.41	11.45	11.70	12.5	0
5	QPSK	1	12	11.24	11.55	11.42	11.66		
5	QPSK	1	24	11.22	11.60	11.31	11.60		
5	QPSK	12	0	11.39	11.52	11.46	11.66	12.5	0
5	QPSK	12	7	11.42	11.51	11.51	11.63		
5	QPSK	12	13	11.33	11.63	11.39	11.70		
5	QPSK	25	0	11.43	11.53	11.45	11.64		
5	16QAM	1	0	11.54	11.72	11.62	11.71	12.5	0
5	16QAM	1	12	11.46	11.78	11.75	11.74		
5	16QAM	1	24	11.58	11.82	11.64	11.79		
5	16QAM	12	0	11.41	11.66	11.54	11.73	12.5	0
5	16QAM	12	7	11.44	11.65	11.64	11.81		
5	16QAM	12	13	11.47	11.76	11.61	11.77		
5	16QAM	25	0	11.51	11.60	11.58	11.88		
5	64QAM	1	0	11.26	11.55	11.31	11.63	12.5	0
5	64QAM	1	12	11.39	11.35	11.31	11.67		
5	64QAM	1	24	11.30	11.40	11.45	11.48		
5	64QAM	12	0	11.46	11.82	11.57	11.76	12.5	0
5	64QAM	12	7	11.61	11.70	11.66	11.79		
5	64QAM	12	13	11.64	11.79	11.62	11.73		
5	64QAM	25	0	11.54	11.86	11.70	11.80		

2.4GHz WLAN	Full Power					
	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
2.4GHz WLAN	802.11b 1Mbps	1	2412	16.55	17.00	100.00
		6	2437	16.86	17.00	
		11	2462	16.63	17.00	
	802.11g 6Mbps	1	2412	14.92	16.00	98.28
		6	2437	15.10	16.00	
		11	2462	15.01	16.00	
	802.11n-HT20 MCS0	1	2412	14.84	16.00	98.16
		6	2437	14.94	16.00	
		11	2462	14.85	16.00	
	802.11n-HT40 MCS0	3	2422	12.69	14.50	94.93
		6	2437	14.06	14.50	
		9	2452	14.05	14.50	

2.4GHz WLA	Sensor on					
	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
2.4GHz WLAN	802.11b 1Mbps	1	2412	8.02	9.00	100.00
		6	2437	8.33	9.00	
		11	2462	8.07	9.00	
	802.11g 6Mbps	1	2412	Not Inquired	8.00	98.28
		6	2437		8.00	
		11	2462		8.00	
	802.11n-HT20 MCS0	1	2412		8.00	98.16
		6	2437		8.00	
		11	2462		8.00	
	802.11n-HT40 MCS0	3	2422		8.00	94.93
		6	2437		8.00	
		9	2452		8.00	

5GHz WLAN	Full Power					
	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.2GHz WLAN	802.11a 6Mbps	36	5180	15.76	17.00	98.28
		40	5200	16.04	17.00	
		44	5220	16.02	17.00	
		48	5240	15.79	17.00	
	802.11n-HT20 MCS0	36	5180	15.80	17.00	98.16
		40	5200	16.05	17.00	
		44	5220	16.04	17.00	
		48	5240	15.82	17.00	
	802.11n-HT40 MCS0	38	5190	13.26	15.00	96.32
		46	5230	13.92	15.00	
	802.11ac-VHT20 MCS0	36	5180	12.78	14.00	98.16
		40	5200	13.03	14.00	
		44	5220	13.02	14.00	
		48	5240	12.80	14.00	
	802.11ac-VHT40 MCS0	38	5190	13.24	14.00	96.32
		46	5230	13.28	14.00	
	802.11ac-VHT80 MCS0	42	5210	11.78	12.00	96.31

5GHz WLA	Sensor on					
	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.2GHz WLAN	802.11a 6Mbps	36	5180	8.06	8.50	98.28
		40	5200	8.11	8.50	
		44	5220	8.19	8.50	
		48	5240	7.90	8.50	
	802.11n-HT20 MCS0	36	5180	Not Inquired	8.50	98.16
		40	5200		8.50	
		44	5220		8.50	
		48	5240		8.50	
	802.11n-HT40 MCS0	38	5190		8.00	96.32
		46	5230		8.00	
	802.11ac-VHT20 MCS0	36	5180		8.50	98.16
		40	5200		8.50	
		44	5220		8.50	
		48	5240		8.50	
	802.11ac-VHT40 MCS0	38	5190		8.00	96.32
		46	5230		8.00	
	802.11ac-VHT80 MCS0	42	5210		8.00	96.31

5GHz WLAN	Full Power					
	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.3GHz WLAN	802.11a 6Mbps	52	5260	15.41	17.00	98.28
		56	5280	15.66	17.00	
		60	5300	15.93	17.00	
		64	5320	15.91	17.00	
	802.11n-HT20 MCS0	52	5260	15.48	17.00	98.16
		56	5280	15.69	17.00	
		60	5300	15.98	17.00	
		64	5320	15.90	17.00	
	802.11n-HT40 MCS0	54	5270	13.88	15.00	96.32
		62	5310	13.78	15.00	
	802.11ac-VHT20 MCS0	52	5260	12.50	14.00	98.16
		56	5280	12.69	14.00	
		60	5300	13.00	14.00	
		64	5320	12.87	14.00	
	802.11ac-VHT40 MCS0	54	5270	12.88	14.00	96.32
		62	5310	13.22	14.00	
	802.11ac-VHT80 MCS0	58	5290	10.84	12.00	96.31

5GHz WLA	Sensor on					
	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.3GHz WLAN	802.11a 6Mbps	52	5260	9.66	10.00	98.28
		56	5280	9.52	10.00	
		60	5300	9.76	10.00	
		64	5320	9.61	10.00	
	802.11n-HT20 MCS0	52	5260	Not Inquired	10.00	98.16
		56	5280		10.00	
		60	5300		10.00	
		64	5320		10.00	
	802.11n-HT40 MCS0	54	5270		9.00	96.32
		62	5310		9.00	
	802.11ac-VHT20 MCS0	52	5260		10.00	98.16
		56	5280		10.00	
		60	5300		10.00	
		64	5320		10.00	
	802.11ac-VHT40 MCS0	54	5270		9.00	96.32
		62	5310		9.00	
	802.11ac-VHT80 MCS0	58	5290		9.00	96.31

5GHz WLAN	Full Power					
	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.5GHz WLAN	802.11a 6Mbps	100	5500	15.74	17.00	98.28
		116	5580	15.80	17.00	
		124	5620	16.27	17.00	
		132	5660	16.18	17.00	
		140	5700	16.19	17.00	
		144	5720	15.93	17.00	
	802.11n-HT20 MCS0	100	5500	15.76	17.00	98.16
		116	5580	15.82	17.00	
		124	5620	16.15	17.00	
		132	5660	16.19	17.00	
		140	5700	15.46	17.00	
		144	5720	16.03	17.00	
	802.11n-HT40 MCS0	102	5510	13.45	15.00	96.32
		110	5550	13.90	15.00	
		126	5630	14.03	15.00	
		134	5670	14.04	15.00	
		142	5710	13.84	15.00	
	802.11ac-VHT20 MCS0	100	5500	12.85	14.00	98.16
		116	5580	12.74	14.00	
		124	5620	13.31	14.00	
		132	5660	13.12	14.00	
		140	5700	13.19	14.00	
		144	5720	12.91	14.00	
	802.11ac-VHT40 MCS0	102	5510	12.88	14.00	96.32
		110	5550	12.95	14.00	
		126	5630	13.02	14.00	
		134	5670	13.07	14.00	
		142	5710	12.90	14.00	
	802.11ac-VHT80 MCS0	106	5530	10.38	12.00	93.31
		122	5610	12.88	13.00	
		138	5690	12.81	13.00	

5GHz WLA	Sensor on					
	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.5GHz WLAN	802.11a 6Mbps	100	5500	7.86	9.00	98.28
		116	5580	8.24	9.00	
		124	5620	8.61	9.00	
		132	5660	8.60	9.00	
		140	5700	8.55	9.00	
		144	5720	8.53	9.00	
	802.11n-HT20 MCS0	100	5500	Not Inquired	9.00	98.16
		116	5580		9.00	
		124	5620		9.00	
		132	5660		9.00	
		140	5700		9.00	
		144	5720		9.00	
	802.11n-HT40 MCS0	102	5510		8.00	96.32
		110	5550		8.00	
		126	5630		8.00	
		134	5670		8.00	
		142	5710		8.00	
	802.11ac-VHT20 MCS0	100	5500		9.00	98.16
		116	5580		9.00	
		124	5620		9.00	
		132	5660		9.00	
		140	5700		9.00	
		144	5720		9.00	
	802.11ac-VHT40 MCS0	102	5510		8.00	96.32
		110	5550		8.00	
		126	5630		8.00	
		134	5670		8.00	
		142	5710		8.00	
	802.11ac-VHT80 MCS0	106	5530		8.00	93.31
		122	5610		8.00	
		138	5690		8.00	

5GHz WLAN	Full Power					
	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.8GHz WLAN	802.11a 6Mbps	149	5745	15.71	17.00	98.28
		157	5785	15.48	17.00	
		165	5825	15.97	17.00	
	802.11n-HT20 MCS0	149	5745	15.72	17.00	98.16
		157	5785	15.48	17.00	
		165	5825	15.91	17.00	
	802.11n-HT40 MCS0	151	5755	13.94	15.00	96.32
		159	5795	13.75	15.00	
	802.11ac-VHT20 MCS0	149	5745	12.72	14.00	98.16
		157	5785	12.54	14.00	
		165	5825	12.91	14.00	
	802.11ac-VHT40 MCS0	151	5755	13.01	14.00	96.32
		159	5795	12.65	14.00	
	802.11ac-VHT80 MCS0	155	5775	13.17	14.00	93.31

5GHz WLA	Sensor on					
	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.8GHz WLAN	802.11a 6Mbps	149	5745	7.45	7.50	98.28
		157	5785	7.26	7.50	
		165	5825	7.31	7.50	
	802.11n-HT20 MCS0	149	5745	Not Inquired	7.50	98.16
		157	5785		7.50	
		165	5825		7.50	
	802.11n-HT40 MCS0	151	5755		7.00	96.32
		159	5795		7.00	
	802.11ac-VHT20 MCS0	149	5745		7.50	98.16
		157	5785		7.50	
		165	5825		7.50	
	802.11ac-VHT40 MCS0	151	5755		7.00	96.32
		159	5795		7.00	
	802.11ac-VHT80 MCS0	155	5775		7.00	93.31

BT BR/EDR

Mode	Channel	Frequency (MHz)	Average power (dBm)		
			1Mbps	2Mbps	3Mbps
BR / EDR	CH 00	2402	11.90	7.20	7.11
	CH 39	2441	12.26	8.03	8.06
	CH 78	2480	11.33	7.06	8.11
Tune-up Limit			12.5	9	9

BT LE

Mode	Channel	Frequency (MHz)	Average power (dBm)
			GFSK
LE	CH 00	2402	2.66
	CH 19	2440	2.76
	CH 39	2480	1.97
Tune-up Limit			3