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Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	53.7Ω+ 6.80jΩ
Return Loss	- 22.6dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.110 ns
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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: 10.18.2021

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d088

Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.387$ S/m; $\epsilon_r = 39.88$; $\rho = 1000$ kg/m³

Phantom section: Right Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7517; ConvF(7.81, 7.81, 7.81) @ 1900 MHz; Calibrated: 2021-02-03
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1556; Calibrated: 2021-01-15
- Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7501)

System Performance Check/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid:

$dx=5$ mm, $dy=5$ mm, $dz=5$ mm

Reference Value = 103.6 V/m; Power Drift = 0.00 dB

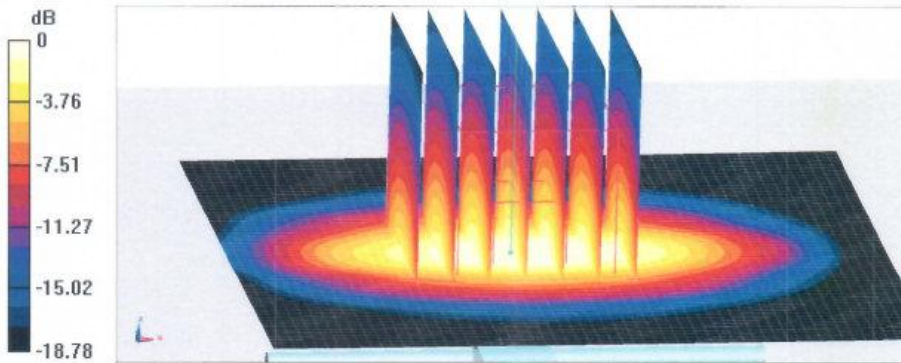
Peak SAR (extrapolated) = 19.2 W/kg

SAR(1 g) = 10 W/kg; SAR(10 g) = 5.1 W/kg

Smallest distance from peaks to all points 3 dB below = 10 mm

Ratio of SAR at M2 to SAR at M1 = 52.1%

Maximum value of SAR (measured) = 15.8 W/kg

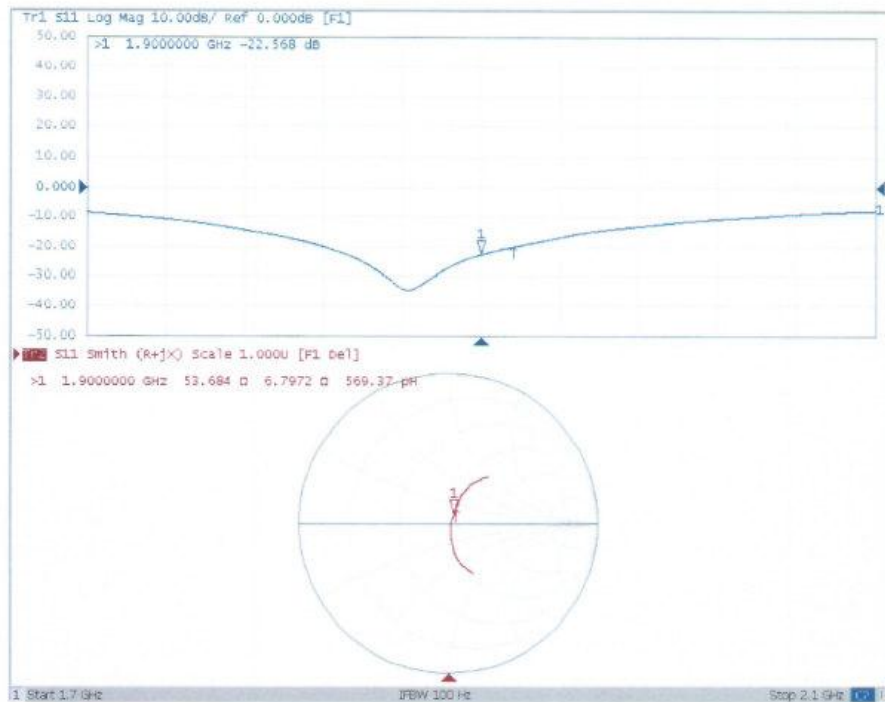


0 dB = 15.8 W/kg = 11.99 dBW/kg



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Impedance Measurement Plot for Head TSL





2450MHz Dipole Calibration Certificate (2018)



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CALIBRATION
CNAS L0570

Client **CTTL(South Branch)**

Certificate No: **Z18-60388**

CALIBRATION CERTIFICATE

Object **D2450V2 - SN: 873**
Calibration Procedure(s) **FF-Z11-003-01**
Calibration Procedures for dipole validation kits
Calibration date: **October 26, 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)°C and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRVD	102083	01-Nov-17 (CTTL, No.J17X08756)	Oct-18
Power sensor NRV-Z5	100542	01-Nov-17 (CTTL, No.J17X08756)	Oct-18
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: October 29, 2018

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



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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:

- 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
- 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
- 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
- KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

Additional Documentation:

- 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	39.2 ± 6 %	1.80 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	13.0 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	52.0 mW / g ± 18.8 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	6.02 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	24.1 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	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	52.8 ± 6 %	2.01 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 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	50.5 mW / g ± 18.8 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	5.91 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	23.5 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	53.5Ω+ 2.11 jΩ
Return Loss	- 28.0dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	51.3Ω+ 4.51 jΩ
Return Loss	- 26.7dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.024 ns
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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: 10.26.2018

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 873

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

Medium parameters used: $f = 2450$ MHz; $\sigma = 1.802$ S/m; $\epsilon_r = 39.2$; $\rho = 1000$ kg/m³

Phantom section: Right Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7514; ConvF(6.95, 6.95, 6.95) @ 2450 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)

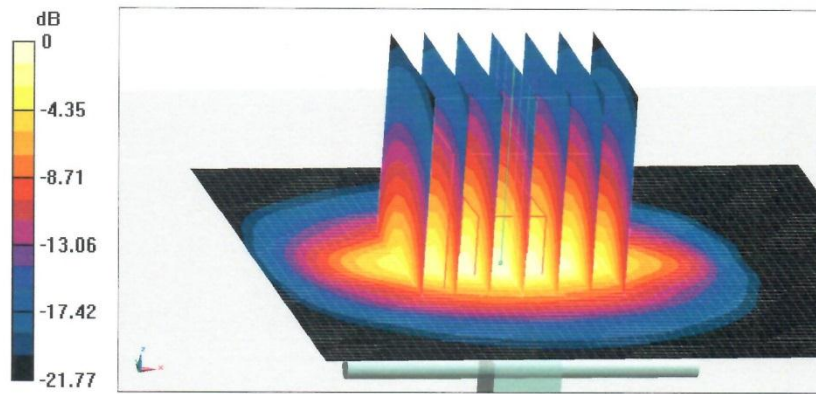
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 105.0 V/m; Power Drift = 0.09 dB

Peak SAR (extrapolated) = 26.8 W/kg

SAR(1 g) = 13 W/kg; SAR(10 g) = 6.02 W/kg

Maximum value of SAR (measured) = 21.8 W/kg



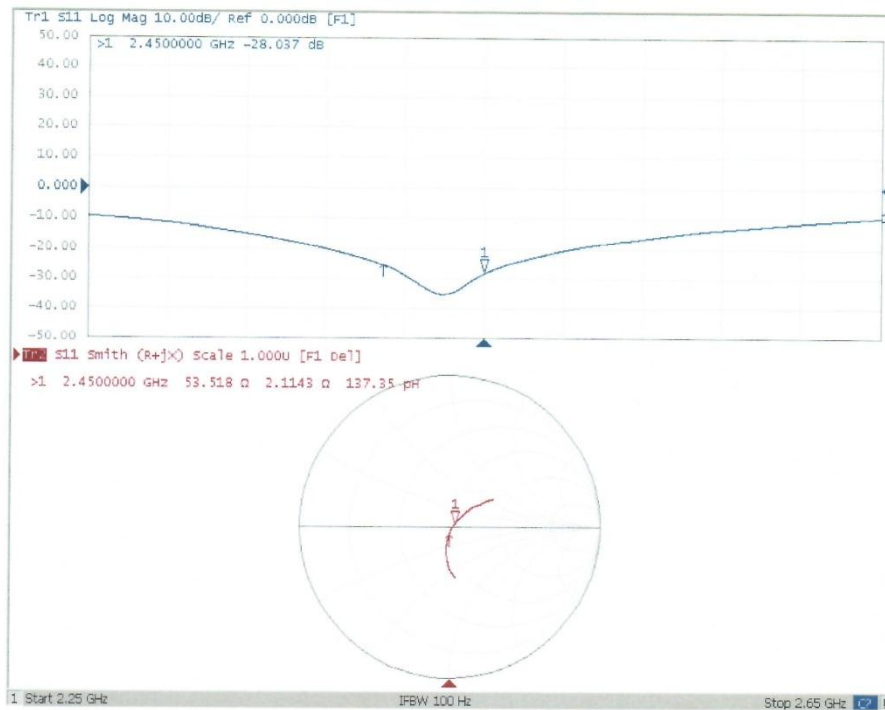
0 dB = 21.8 W/kg = 13.38 dBW/kg



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Impedance Measurement Plot for Head TSL





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DASY5 Validation Report for Body TSL

Date: 10.26.2018

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 873

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

Medium parameters used: $f = 2450$ MHz; $\sigma = 2.008$ S/m; $\epsilon_r = 52.76$; $\rho = 1000$ kg/m³

Phantom section: Center Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7514; ConvF(7.13, 7.13, 7.13) @ 2450 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)

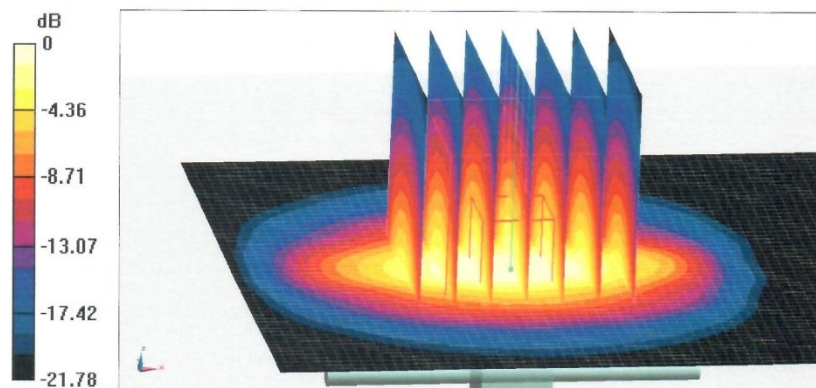
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 98.89 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 26.4 W/kg

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

Maximum value of SAR (measured) = 21.3 W/kg



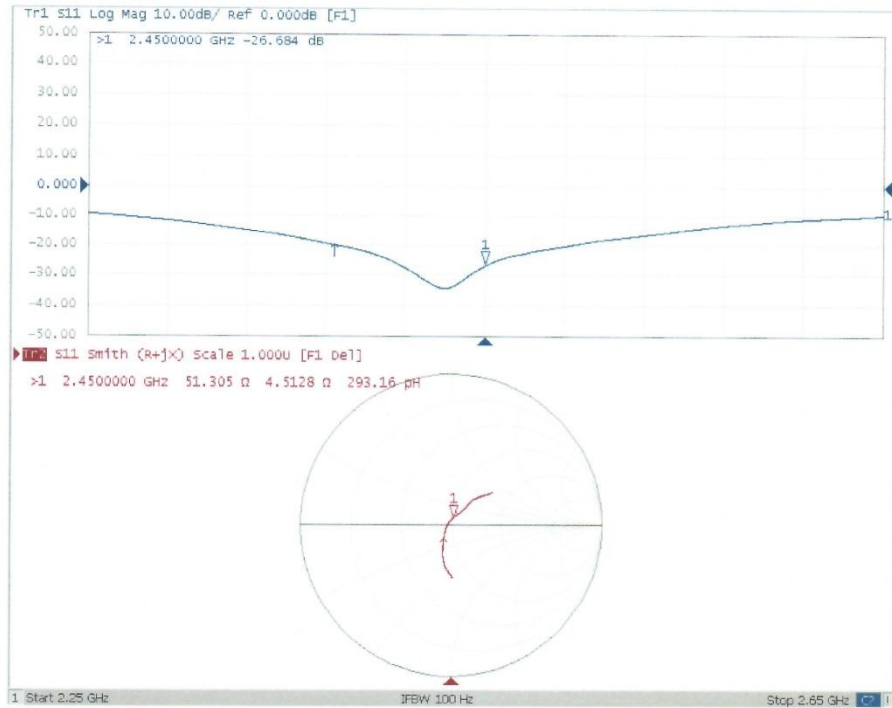
0 dB = 21.3 W/kg = 13.28 dBW/kg



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Impedance Measurement Plot for Body TSL





2450MHz Dipole Calibration Certificate (2021)



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CNAS L0570

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Client SAICT

Certificate No: Z21-60358

CALIBRATION CERTIFICATE			
Object	D2450V2 - SN: 873		
Calibration Procedure(s)	FF-Z11-003-01 Calibration Procedures for dipole validation kits		
Calibration date:	October 21, 2021		
<p>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.</p> <p>All calibrations have been conducted in the closed laboratory facility: environment temperature (22±3)°C and humidity<70%.</p> <p>Calibration Equipment used (M&TE critical for calibration)</p>			
Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	106277	24-Sep-21 (CTTL, No.J21X08326)	Sep-22
Power sensor NRP8S	104291	24-Sep-21 (CTTL, No.J21X08326)	Sep-22
Reference Probe EX3DV4	SN 7517	03-Feb-21(CTTL-SPEAG.No.Z21-60001)	Feb-22
DAE4	SN 1556	15-Jan-21(SPEAG,No.DAE4-1556_Jan21)	Jan-22
Secondary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Signal Generator E4438C	MY49071430	01-Feb-21 (CTTL, No.J21X00593)	Jan-22
NetworkAnalyzer E5071C	MY46110673	14-Jan-21 (CTTL, No.J21X00232)	Jan-22
Calibrated by:	Name Zhao Jing	Function SAR Test Engineer	Signature
Reviewed by:	Name Lin Hao	Function SAR Test Engineer	Signature
Approved by:	Name Qi Dianyuan	Function SAR Project Leader	Signature
Issued: October 27, 2021			
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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:

- 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
- 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
- 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
- KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

Additional Documentation:

- 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	V52.10.4
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 \pm 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 \pm 0.2) °C	39.5 \pm 6 %	1.81 mho/m \pm 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	53.2 W/kg \pm 18.8 % (k=2)
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	6.05 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	24.2 W/kg \pm 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	53.6Ω+ 1.26jΩ
Return Loss	- 28.8dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.066 ns
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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: 10.21.2021

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 873

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

Medium parameters used: $f = 2450$ MHz; $\sigma = 1.809$ S/m; $\epsilon_r = 39.51$; $\rho = 1000$ kg/m³

Phantom section: Right Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7517; ConvF(7.34, 7.34, 7.34) @ 2450 MHz; Calibrated: 2021-02-03
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1556; Calibrated: 2021-01-15
- Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7501)

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

Reference Value = 108.0 V/m; Power Drift = -0.03 dB

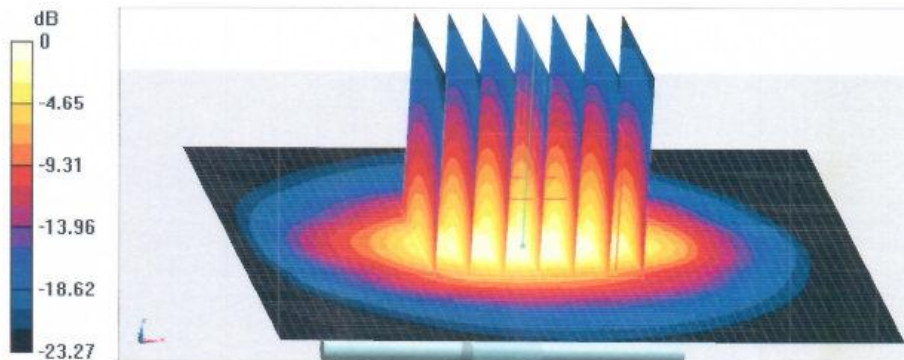
Peak SAR (extrapolated) = 28.0 W/kg

SAR(1 g) = 13.3 W/kg; SAR(10 g) = 6.05 W/kg

Smallest distance from peaks to all points 3 dB below = 9.2 mm

Ratio of SAR at M2 to SAR at M1 = 46.9%

Maximum value of SAR (measured) = 22.6 W/kg



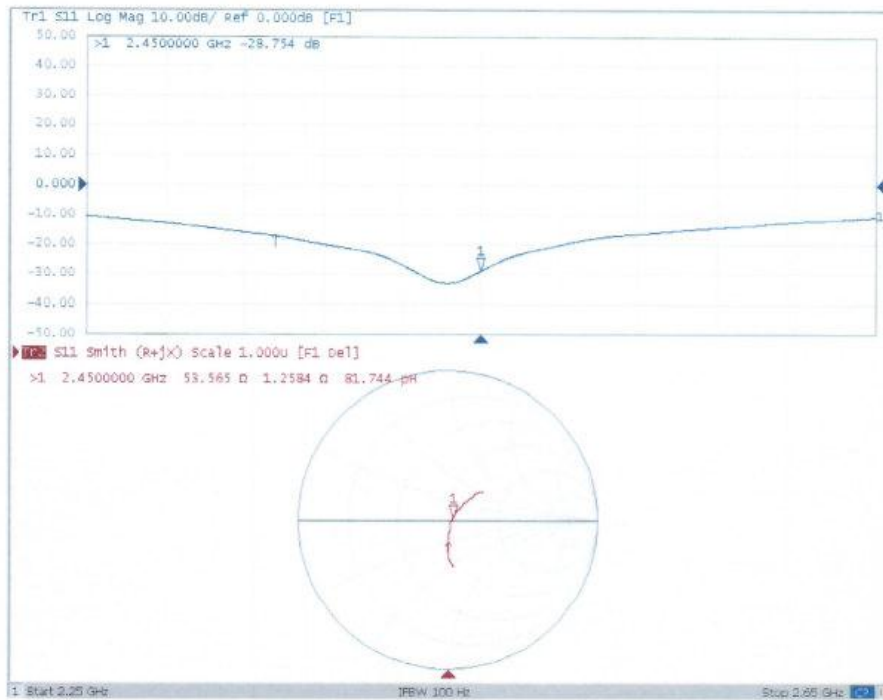
0 dB = 22.6 W/kg = 13.54 dBW/kg



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Impedance Measurement Plot for Head TSL





2550MHz Dipole Calibration Certificate (2018)

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



S Schweizerischer Kalibrierdienst
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Accreditation No.: SCS 0108

Client CTTL (Auden)

Certificate No: D2550V2-1010_Aug18

CALIBRATION CERTIFICATE

Object D2550V2 - SN:1010

Calibration procedure(s) QA CAL-05.v10
Calibration procedure for dipole validation kits above 700 MHz

Calibration date: August 24, 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)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Table with 4 columns: Primary Standards, ID #, Cal Date (Certificate No.), Scheduled Calibration. Lists equipment like Power meter NRP, Power sensor NRP-Z91, Reference 20 dB Attenuator, etc.

Table with 4 columns: Secondary Standards, ID #, Check Date (in house), Scheduled Check. Lists equipment like Power meter EPM-442A, Power sensor HP 8481A, RF generator R&S SMT-06, etc.

Calibrated by: Manu Seitz, Laboratory Technician
Approved by: Katja Pokovic, Technical Manager

Issued: August 24, 2018

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

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



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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:

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

Additional Documentation:

- 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	V52.10.1
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2550 MHz \pm 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.1	1.91 mho/m
Measured Head TSL parameters	(22.0 \pm 0.2) °C	37.3 \pm 6 %	1.97 mho/m \pm 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	14.8 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	57.8 W/kg \pm 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.73 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	26.5 W/kg \pm 16.5 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	52.6	2.09 mho/m
Measured Body TSL parameters	(22.0 \pm 0.2) °C	51.5 \pm 6 %	2.14 mho/m \pm 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	13.7 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	54.0 W/kg \pm 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	6.22 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	24.7 W/kg \pm 16.5 % (k=2)

Appendix (Additional assessments outside the scope of SCS 0108)**Antenna Parameters with Head TSL**

Impedance, transformed to feed point	54.9 Ω - 2.3 j Ω
Return Loss	- 25.7 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	49.6 Ω - 2.0 j Ω
Return Loss	- 33.8 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.151 ns
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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
Manufactured on	August 03, 2012

DASY5 Validation Report for Head TSL

Date: 24.08.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2550 MHz; Type: D2550V2; Serial: D2550V2 - SN:1010

Communication System: UID 0 - CW; Frequency: 2550 MHz

Medium parameters used: $f = 2550$ MHz; $\sigma = 1.97$ S/m; $\epsilon_r = 37.3$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(7.43, 7.43, 7.43) @ 2550 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

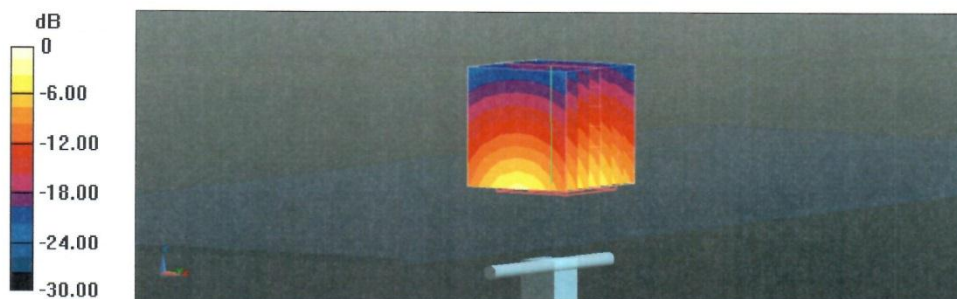
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 119.6 V/m; Power Drift = -0.07 dB

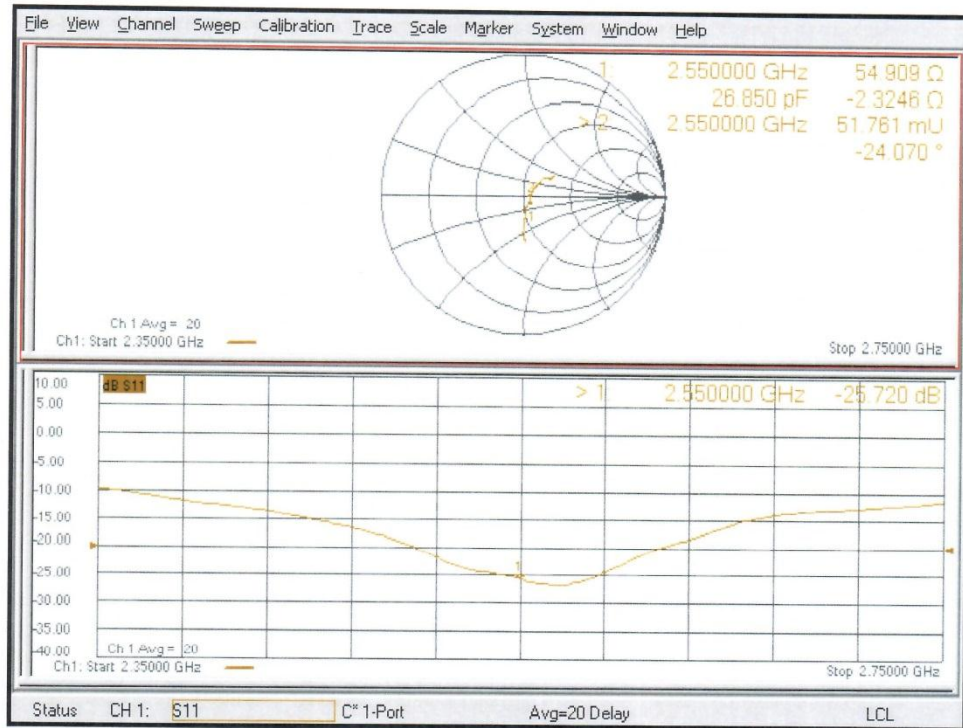
Peak SAR (extrapolated) = 30.5 W/kg

SAR(1 g) = 14.8 W/kg; SAR(10 g) = 6.73 W/kg

Maximum value of SAR (measured) = 24.9 W/kg



Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 24.08.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2550 MHz; Type: D2550V2; Serial: D2550V2 - SN:1010

Communication System: UID 0 - CW; Frequency: 2550 MHz

Medium parameters used: $f = 2550$ MHz; $\sigma = 2.14$ S/m; $\epsilon_r = 51.5$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(7.68, 7.68, 7.68) @ 2550 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

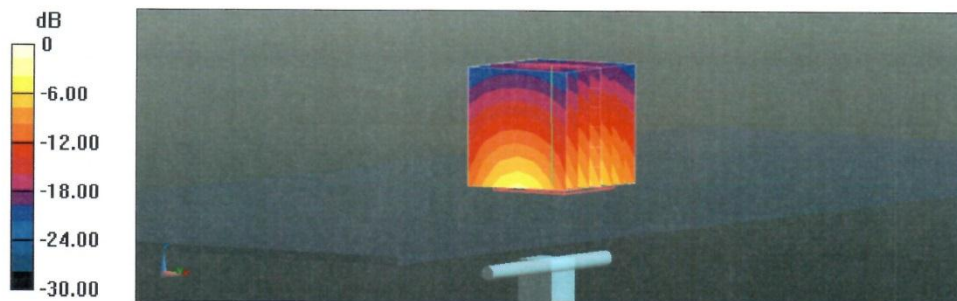
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 109.2 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 27.9 W/kg

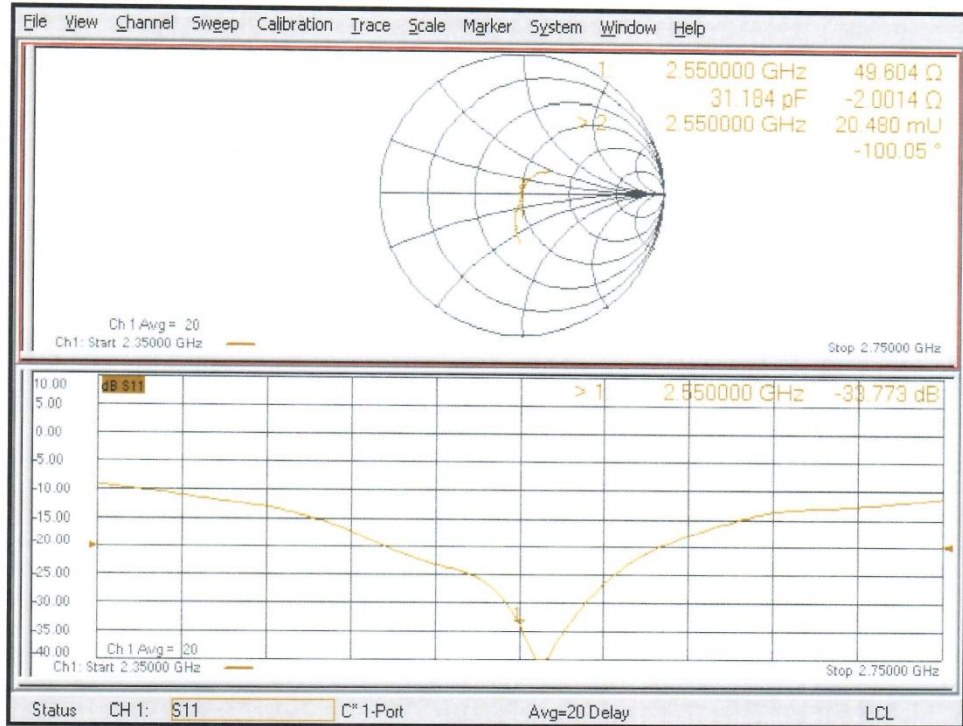
SAR(1 g) = 13.7 W/kg; SAR(10 g) = 6.22 W/kg

Maximum value of SAR (measured) = 22.9 W/kg



0 dB = 22.9 W/kg = 13.60 dBW/kg

Impedance Measurement Plot for Body TSL



2550MHz Dipole Calibration Certificate (2021)

Calibration Laboratory of
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Accreditation No.: SCS 0108

Client TMC-SZ (Auden)

Certificate No: D2550V2-1010_May21

CALIBRATION CERTIFICATE																																																											
Object	D2550V2 - SN:1010																																																										
Calibration procedure(s)	QA CAL-05.v11 Calibration Procedure for SAR Validation Sources between 0.7-3 GHz																																																										
Calibration date:	May 21, 2021																																																										
<p>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.</p> <p>All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3) °C and humidity < 70%.</p> <p>Calibration Equipment used (M&TE critical for calibration)</p> <table border="1"> <thead> <tr> <th>Primary Standards</th> <th>ID #</th> <th>Cal Date (Certificate No.)</th> <th>Scheduled Calibration</th> </tr> </thead> <tbody> <tr> <td>Power meter NRP</td> <td>SN: 104778</td> <td>09-Apr-21 (No. 217-03291/03292)</td> <td>Apr-22</td> </tr> <tr> <td>Power sensor NRP-Z91</td> <td>SN: 103244</td> <td>09-Apr-21 (No. 217-03291)</td> <td>Apr-22</td> </tr> <tr> <td>Power sensor NRP-Z91</td> <td>SN: 103245</td> <td>09-Apr-21 (No. 217-03292)</td> <td>Apr-22</td> </tr> <tr> <td>Reference 20 dB Attenuator</td> <td>SN: BH9394 (20k)</td> <td>09-Apr-21 (No. 217-03343)</td> <td>Apr-22</td> </tr> <tr> <td>Type-N mismatch combination</td> <td>SN: 310982 / 06327</td> <td>09-Apr-21 (No. 217-03344)</td> <td>Apr-22</td> </tr> <tr> <td>Reference Probe EX3DV4</td> <td>SN: 7349</td> <td>28-Dec-20 (No. EX3-7349_Dec20)</td> <td>Dec-21</td> </tr> <tr> <td>DAE4</td> <td>SN: 601</td> <td>02-Nov-20 (No. DAE4-601_Nov20)</td> <td>Nov-21</td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th>Secondary Standards</th> <th>ID #</th> <th>Check Date (in house)</th> <th>Scheduled Check</th> </tr> </thead> <tbody> <tr> <td>Power meter E4419B</td> <td>SN: GB39512475</td> <td>30-Oct-14 (in house check Oct-20)</td> <td>In house check: Oct-22</td> </tr> <tr> <td>Power sensor HP 8481A</td> <td>SN: US37292783</td> <td>07-Oct-15 (in house check Oct-20)</td> <td>In house check: Oct-22</td> </tr> <tr> <td>Power sensor HP 8481A</td> <td>SN: MY41092317</td> <td>07-Oct-15 (in house check Oct-20)</td> <td>In house check: Oct-22</td> </tr> <tr> <td>RF generator R&S SMT-06</td> <td>SN: 100972</td> <td>15-Jun-15 (in house check Oct-20)</td> <td>In house check: Oct-22</td> </tr> <tr> <td>Network Analyzer Agilent E8358A</td> <td>SN: US41080477</td> <td>31-Mar-14 (in house check Oct-20)</td> <td>In house check: Oct-21</td> </tr> </tbody> </table>				Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration	Power meter NRP	SN: 104778	09-Apr-21 (No. 217-03291/03292)	Apr-22	Power sensor NRP-Z91	SN: 103244	09-Apr-21 (No. 217-03291)	Apr-22	Power sensor NRP-Z91	SN: 103245	09-Apr-21 (No. 217-03292)	Apr-22	Reference 20 dB Attenuator	SN: BH9394 (20k)	09-Apr-21 (No. 217-03343)	Apr-22	Type-N mismatch combination	SN: 310982 / 06327	09-Apr-21 (No. 217-03344)	Apr-22	Reference Probe EX3DV4	SN: 7349	28-Dec-20 (No. EX3-7349_Dec20)	Dec-21	DAE4	SN: 601	02-Nov-20 (No. DAE4-601_Nov20)	Nov-21	Secondary Standards	ID #	Check Date (in house)	Scheduled Check	Power meter E4419B	SN: GB39512475	30-Oct-14 (in house check Oct-20)	In house check: Oct-22	Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-20)	In house check: Oct-22	Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-20)	In house check: Oct-22	RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-20)	In house check: Oct-22	Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-20)	In house check: Oct-21
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Approved by:	Name Katja Pokovic	Function Technical Manager	Signature 																																																								
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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:

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

Additional Documentation:

- 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	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	$dx, dy, dz = 5 \text{ mm}$	
Frequency	$2550 \text{ MHz} \pm 1 \text{ MHz}$	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.1	1.91 mho/m
Measured Head TSL parameters	$(22.0 \pm 0.2) \text{ °C}$	$37.4 \pm 6 \%$	$1.99 \text{ mho/m} \pm 6 \%$
Head TSL temperature change during test	$< 0.5 \text{ °C}$	---	---

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 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	55.9 W/kg \pm 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.42 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	25.2 W/kg \pm 16.5 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	52.6	2.09 mho/m
Measured Body TSL parameters	$(22.0 \pm 0.2) \text{ °C}$	$50.8 \pm 6 \%$	$2.16 \text{ mho/m} \pm 6 \%$
Body TSL temperature change during test	$< 0.5 \text{ °C}$	---	---

SAR result with Body TSL

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	13.4 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	52.4 W/kg \pm 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	6.04 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	23.8 W/kg \pm 16.5 % (k=2)

Appendix (Additional assessments outside the scope of SCS 0108)**Antenna Parameters with Head TSL**

Impedance, transformed to feed point	52.8 Ω - 3.8 $\mu\Omega$
Return Loss	- 26.8 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	49.3 Ω - 1.8 $\mu\Omega$
Return Loss	- 34.3 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.153 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: 21.05.2021

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2550 MHz; Type: D2550V2; Serial: D2550V2 - SN:1010

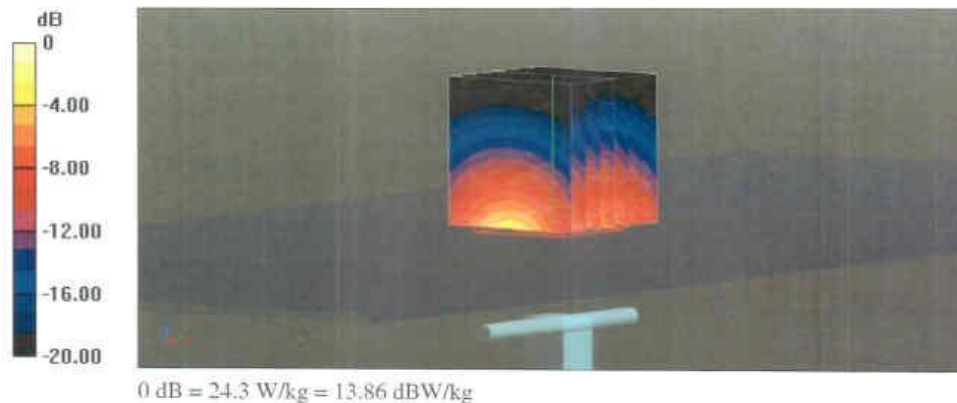
Communication System: UID 0 - CW; Frequency: 2550 MHz
 Medium parameters used: $f = 2550$ MHz; $\sigma = 1.99$ S/m; $\epsilon_r = 37.4$; $\rho = 1000$ kg/m³
 Phantom section: Flat Section
 Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

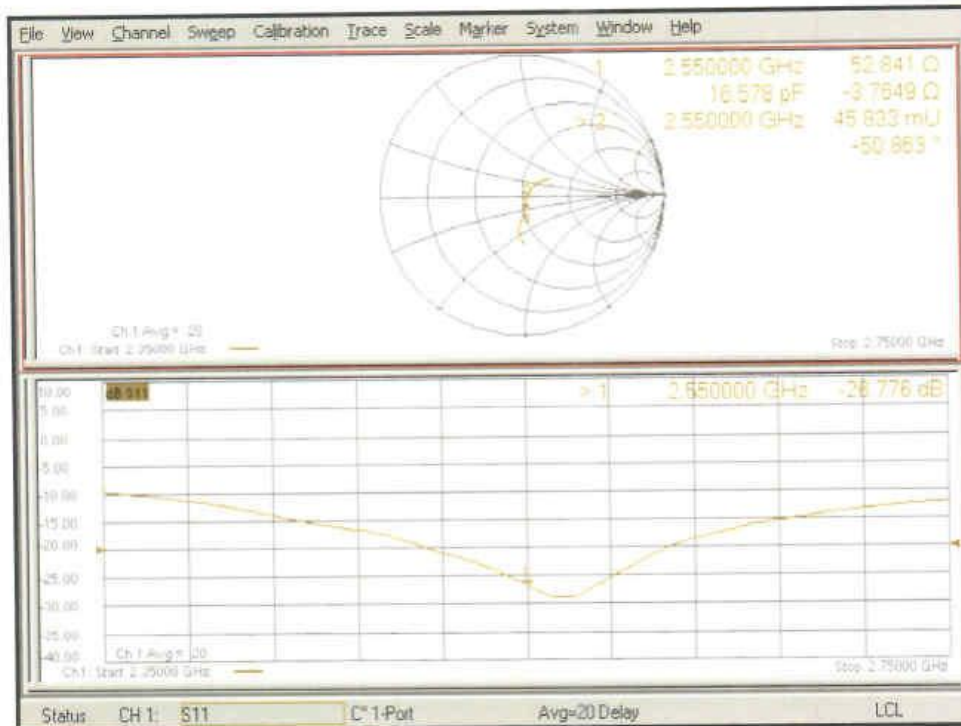
- Probe: EX3DV4 - SN7349; ConvF(7.85, 7.85, 7.85) @ 2550 MHz; Calibrated: 28.12.2020
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 02.11.2020
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
 Reference Value = 119.0 V/m; Power Drift = 0.05 dB
 Peak SAR (extrapolated) = 29.6 W/kg
SAR(1 g) = 14.4 W/kg; SAR(10 g) = 6.42 W/kg
 Smallest distance from peaks to all points 3 dB below = 8.9 mm
 Ratio of SAR at M2 to SAR at M1 = 48.2%
 Maximum value of SAR (measured) = 24.3 W/kg



Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 21.05.2021

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2550 MHz; Type: D2550V2; Serial: D2550V2 - SN:1010

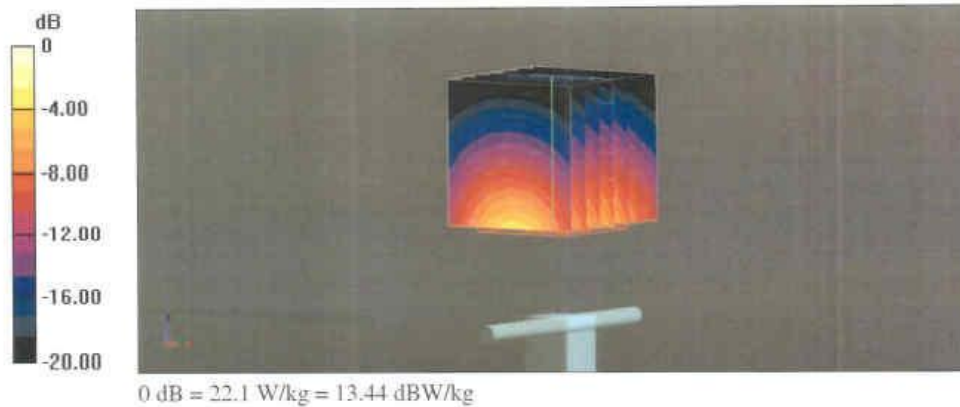
Communication System: UID 0 - CW; Frequency: 2550 MHz
 Medium parameters used: $f = 2550$ MHz; $\sigma = 2.16$ S/m; $\epsilon_r = 50.8$; $\rho = 1000$ kg/m³
 Phantom section: Flat Section
 Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

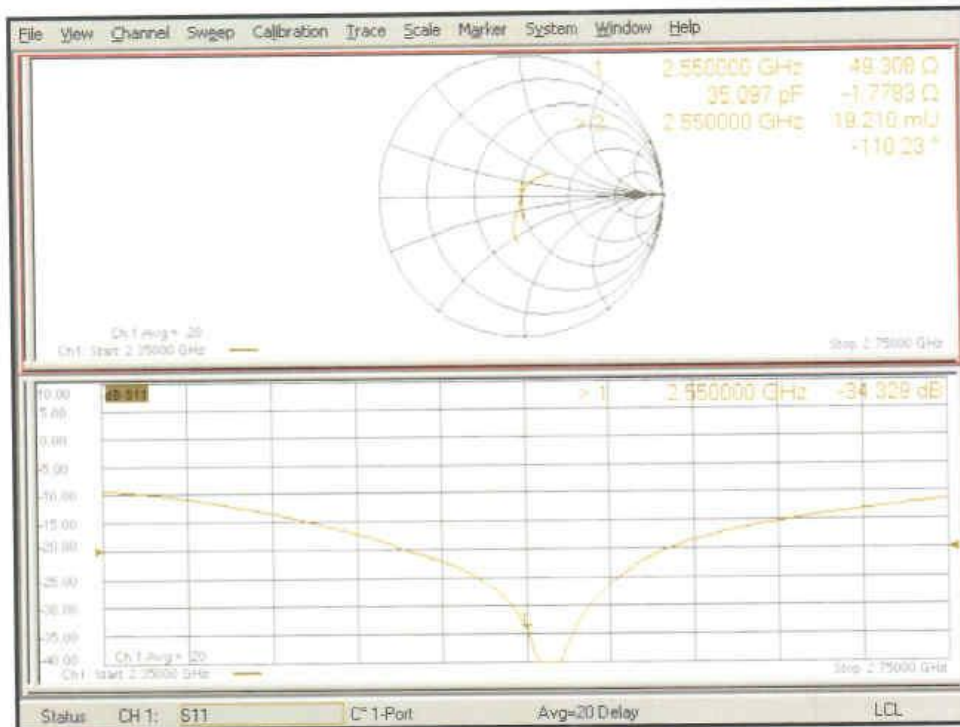
- Probe: EX3DV4 - SN7349; ConvF(7.98, 7.98, 7.98) @ 2550 MHz; Calibrated: 28.12.2020
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 02.11.2020
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
 Reference Value = 110.2 V/m; Power Drift = -0.01 dB
 Peak SAR (extrapolated) = 26.1 W/kg
SAR(1 g) = 13.4 W/kg; SAR(10 g) = 6.04 W/kg
 Smallest distance from peaks to all points 3 dB below = 8 mm
 Ratio of SAR at M2 to SAR at M1 = 51.9%
 Maximum value of SAR (measured) = 22.1 W/kg



Impedance Measurement Plot for Body TSL



ANNEX J: Extended Calibration SAR Dipole

Referring to KDB865664 D01, if dipoles are verified in return loss (<-20dBm, 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.

Justification of Extended Calibration SAR Dipole D750V3– serial no.1163

Head						
Date of Measurement	Return-Loss (dB)	Delta (%)	Real Impedance (ohm)	Delta (ohm)	Imaginary Impedance (johm)	Delta (johm)
2019-09-03	-26.9	/	50.5	/	-4.53	/
2020-09-01	-25.8	4.1	51.2	0.7	-4.29	0.24
2020-10-05	-22.8	7.3	50.1	1.3	-5.48	0.24

Justification of Extended Calibration SAR Dipole D835V2– serial no.4d057

Head						
Date of Measurement	Return-Loss (dB)	Delta (%)	Real Impedance (ohm)	Delta (ohm)	Imaginary Impedance (johm)	Delta (johm)
2018-10-09	-27.7	/	49.6	/	-4.08	/
2019-10-06	-26.9	2.9	50.1	0.5	-3.95	0.13
2020-10-05	-25.4	8.3	56.7	1.8	-2.15	0.15

Justification of Extended Calibration SAR Dipole D1750V2– serial no.1152

Head						
Date of Measurement	Return-Loss (dB)	Delta (%)	Real Impedance (ohm)	Delta (ohm)	Imaginary Impedance (johm)	Delta (johm)
2019-08-30	-38.1	/	49.1	/	-0.84	/
2020-08-28	-36.5	4.2	50.2	1.1	-0.49	0.35
2021-08-26	-35.7	6.3	50.8	1.7	-0.42	0.42

Justification of Extended Calibration SAR Dipole D1900V2– serial no.5d088

Head						
Date of Measurement	Return-Loss (dB)	Delta (%)	Real Impedance (ohm)	Delta (ohm)	Imaginary Impedance (johm)	Delta (johm)
2018-10-24	-23.2	/	52.7	/	6.63	/
2019-10-22	-22.9	1.3	53.5	0.8	6.86	0.23
2020-10-20	-20.7	10.8	54.4	1.7	6.95	0.32



Justification of Extended Calibration SAR Dipole D2450V2– serial no.873

Head						
Date of Measurement	Return-Loss (dB)	Delta (%)	Real Impedance (ohm)	Delta (ohm)	Imaginary Impedance (johm)	Delta (johm)
2018-10-26	-28.0	/	53.5	/	2.11	/
2019-10-22	-27.3	2.5	54.4	0.9	2.29	0.18
2020-10-20	-24.9	11.1	55.1	1.6	2.46	0.35

Justification of Extended Calibration SAR Dipole D2550V2– serial no.1010

Head						
Date of Measurement	Return-Loss (dB)	Delta (%)	Real Impedance (ohm)	Delta (ohm)	Imaginary Impedance (johm)	Delta (johm)
2018-08-24	-25.7	/	54.9	/	-2.30	/
2019-08-22	-24.8	3.5	55.8	0.9	-2.22	0.08
2020-08-20	-23.2	9.7	56.4	1.5	-2.13	0.17

The Return-Loss is <-20dB, and within 20% of prior calibration; the impedance is within 5 ohm of prior calibration. Therefore the value result should support extended cabration.

ANNEX K: Spot Check Test

As the test lab for TA-1339 from HMD Global Oy, we, Shenzhen Academy of Information and Communications Technology, declare on our sole responsibility that, according to “Justification Letter” provided by applicant, only the Spot check test should be performed. The test results are as below.

K.1. Internal Identification of EUT used during the spot check test

EUT ID*	IMEI	HW Version	SW Version	Receipt Date
UT04aa	357321211569925	V01B	000T_0_513	2022-01-05
UT06aa	357321211569628	V01B	000T_0_513	2022-01-05

K.2. Measurement results

GSM850 SAR Values

Frequency		Test Position		Conducted Power (dBm)	Max. tune-up Power (dBm)	SAR(1g) (W/kg)		
Ch.	MHz					Spot check data		Original data
						Measured SAR	Reported SAR	
190	836.6	Head	Left Cheek	31.89	33.0	0.216	0.28	0.30
190	836.6	Body	Rear	29.84	31.0	0.312	0.41	0.42

GSM1900 SAR Values

Frequency		Test Position		Conducted Power (dBm)	Max. tune-up Power (dBm)	SAR(1g) (W/kg)		
Ch.	MHz					Spot check data		Original data
						Measured SAR	Reported SAR	
512	1850.2	Head	Right Cheek	29.05	30.0	0.005	0.01	0.04
512	1850.2	Body	Rear	23.04	23.5	0.390	0.43	0.61

WCDMA Band 2 SAR Values

Frequency		Test Position		Conducted Power (dBm)	Max. tune-up Power (dBm)	SAR(1g) (W/kg)		
Ch.	MHz					Spot check data		Original data
						Measured SAR	Reported SAR	
9400	1800.0	Head	Right Cheek	23.60	24.5	0.125	0.15	0.06
9400	1800.0	Body	Rear	19.60	20.5	0.667	0.82	1.05

WCDMA Band 4 SAR Values

Frequency		Test Position		Conducted Power (dBm)	Max. tune-up Power (dBm)	SAR(1g) (W/kg)		
Ch.	MHz					Spot check data		Original data
						Measured SAR	Reported SAR	
1413	1732.6	Head	Left Tilt	24.60	25.0	0.104	0.11	0.26
1413	1732.6	Body	Rear	22.60	23.0	0.474	0.52	0.43

WCDMA Band 5 SAR Values

Frequency		Test Position		Conducted Power (dBm)	Max. tune-up Power (dBm)	SAR(1g) (W/kg)		
Ch.	MHz					Spot check data		Original data
						Measured SAR	Reported SAR	
4182	836.4	Head	Left Cheek	23.40	24.5	0.251	0.32	0.33
4182	836.4	Body	Rear	23.40	24.5	0.363	0.47	0.37

LTE Band 2 SAR Values

Frequency		Test Position		Conducted Power (dBm)	Max. tune-up Power (dBm)	SAR(1g) (W/kg)		
Ch.	MHz					Spot check data		Original data
						Measured SAR	Reported SAR	
18900	1880.0	Head	Right Cheek	23.17	24.0	0.116	0.14	0.10
18900	1880.0	Body	Rear	19.98	21.0	0.817	1.03	1.12

LTE Band 5 SAR Values

Frequency		Test Position		Conducted Power (dBm)	Max. tune-up Power (dBm)	SAR(1g) (W/kg)		
Ch.	MHz					Spot check data		Original data
						Measured SAR	Reported SAR	
20525	836.5	Head	Left Cheek	23.23	24.0	0.245	0.29	0.23
20525	836.5	Body	Right	23.23	24.0	0.275	0.33	0.29

LTE Band 7 SAR Values

Frequency		Test Position		Conducted Power (dBm)	Max. tune-up Power (dBm)	SAR(1g) (W/kg)		
Ch.	MHz					Spot check data		Original data
						Measured SAR	Reported SAR	
20850	2510.0	Head	Left Cheek	21.87	22.5	0.216	0.25	0.13
21350	2560.0	Body	Rear	21.85	22.5	0.565	0.66	1.16

LTE Band 12 SAR Values

Frequency		Test Position		Conducted Power (dBm)	Max. tune-up Power (dBm)	SAR(1g) (W/kg)		
Ch.	MHz					Spot check data		Original data
						Measured SAR	Reported SAR	
23095	707.5	Head	Left Cheek	23.21	24.0	0.109	0.13	0.07
23095	707.5	Body	Rear	23.21	24.0	0.186	0.22	0.15



LTE Band 28 SAR Values

Frequency		Test Position		Conducted Power (dBm)	Max. tune-up Power (dBm)	SAR(1g) (W/kg)		
Ch.	MHz					Spot check data		Original data
						Measured SAR	Reported SAR	
27460	728.0	Head	Left Cheek	22.98	24.0	0.167	0.21	0.13
27460	728.0	Body	Rear	22.98	24.0	0.268	0.34	0.25

LTE Band 66 SAR Values

Frequency		Test Position		Conducted Power (dBm)	Max. tune-up Power (dBm)	SAR(1g) (W/kg)		
Ch.	MHz					Spot check data		Original data
						Measured SAR	Reported SAR	
132072	1720.0	Head	Right Cheek	23.27	24.0	0.179	0.21	0.18
132322	1745.0	Body	Rear	17.98	19.0	0.641	0.81	1.10

WLAN 2.4G SAR Values

Frequency		Test Position		Conducted Power (dBm)	Max. tune-up Power (dBm)	SAR(1g) (W/kg)		
Ch.	MHz					Spot check data		Original data
						Measured SAR	Reported SAR	
11	2462.0	Head	Right Cheek	17.53	18.5	0.461	0.58	0.74
11	2462.0	Body	Rear	17.53	18.5	0.164	0.21	0.21

K.3. Graph Results for Spot Check

GSM850 Head

Date: 2022-1-27

Electronics: DAE4 Sn786

Medium: Head 835MHz

Medium parameters used (interpolated): $f = 836.6$ MHz; $\sigma = 0.917$ S/m; $\epsilon_r = 40.823$; $\rho = 1000$ kg/m³

Communication System: UID 0, GSM (0) Frequency: 836.6 MHz Duty Cycle: 1:8.3

Probe: ES3DV3 – SN3151 ConvF (6.40, 6.40, 6.40);

Left Cheek Middle/Area Scan (61x61x1): Interpolated grid: $dx=1.500$ mm, $dy=1.500$ mm

Maximum value of SAR (interpolated) = 0.234 W/kg

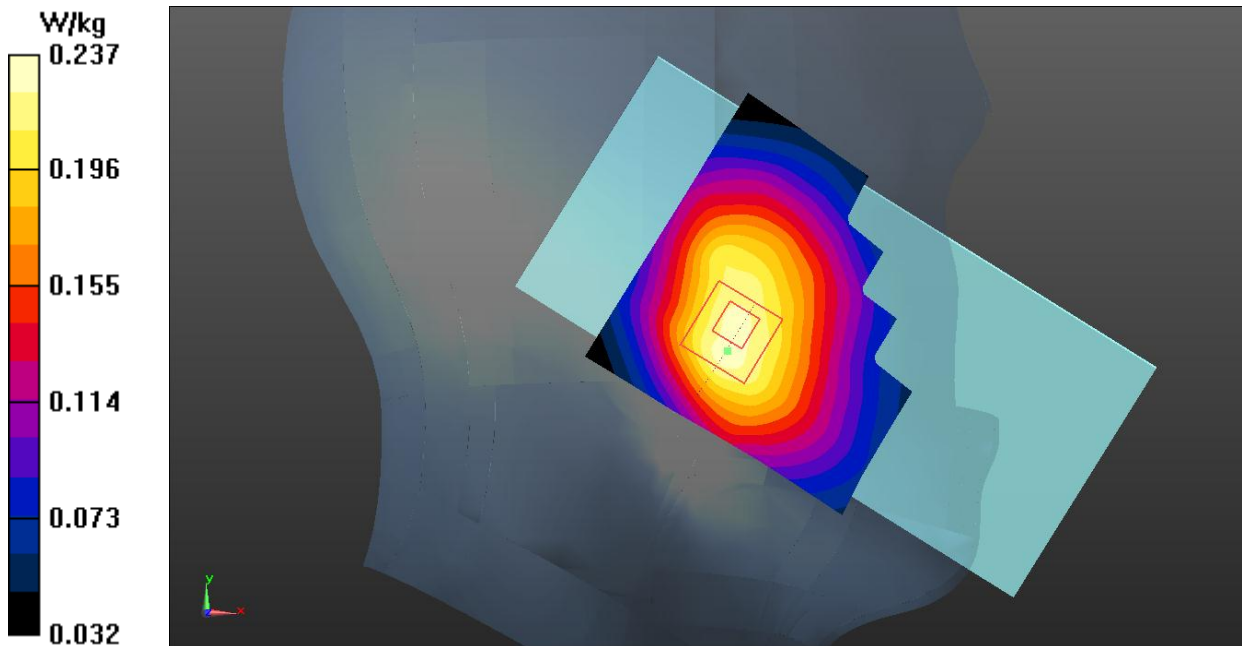
Left Cheek Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8$ mm, $dy=8$ mm, $dz=5$ mm

Reference Value = 4.907 V/m; Power Drift = 0.08 dB

Peak SAR (extrapolated) = 0.277 W/kg

SAR(1 g) = 0.216 W/kg; SAR(10 g) = 0.166 W/kg

Maximum value of SAR (measured) = 0.237 W/kg



GSM850 Body

Date: 2022-1-27

Electronics: DAE4 Sn786

Medium: Head 835MHz

Medium parameters used (interpolated): $f = 836.6$ MHz; $\sigma = 0.917$ S/m; $\epsilon_r = 40.823$; $\rho = 1000$ kg/m³

Communication System: UID 0, GPRS 2Txslot (0) Frequency: 836.6 MHz Duty Cycle: 1:4

Probe: ES3DV3 – SN3151 ConvF (6.40, 6.40, 6.40);

Rear Side Middle/Area Scan (61x71x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.339 W/kg

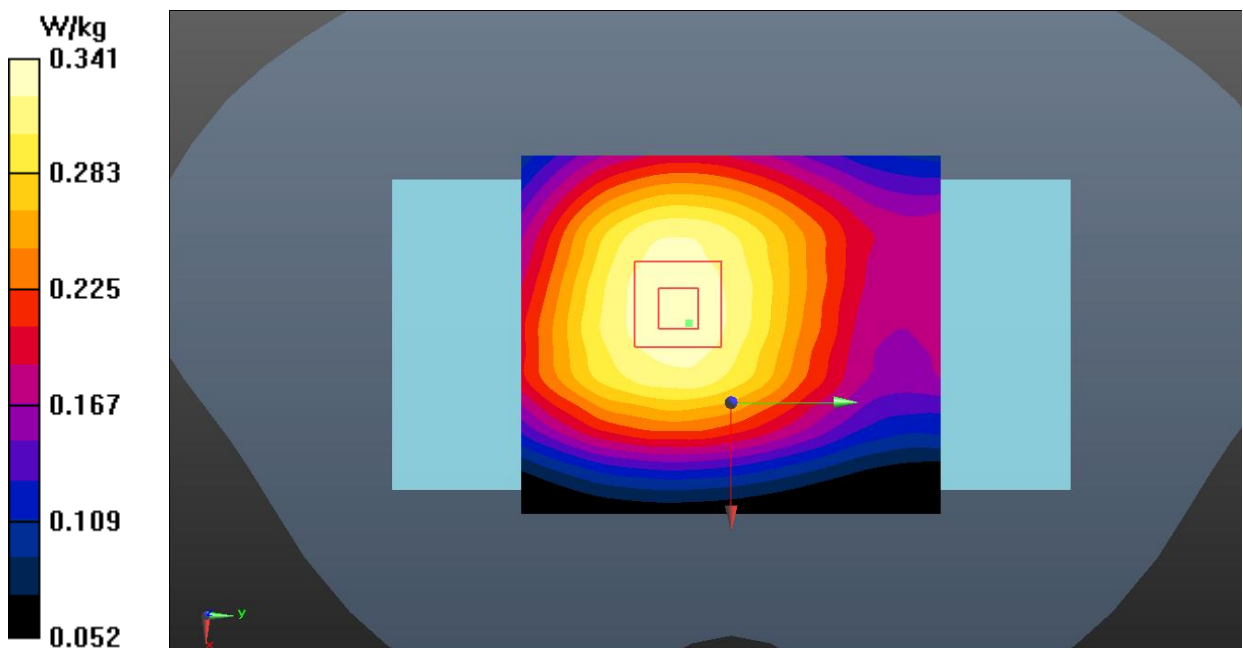
Rear Side Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 17.70 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 0.400 W/kg

SAR(1 g) = 0.312 W/kg; SAR(10 g) = 0.239 W/kg

Maximum value of SAR (measured) = 0.341 W/kg



GSM1900 Head

Date: 2022-1-28

Electronics: DAE4 Sn786

Medium: Head 1900MHz

Medium parameters used (interpolated): $f = 1850.2$ MHz; $\sigma = 1.374$ S/m; $\epsilon_r = 39.418$; $\rho = 1000$ kg/m³

Communication System: UID 0, GSM (0) Frequency: 1850.2 MHz Duty Cycle: 1:8.3

Probe: ES3DV3 – SN3151 ConvF (5.09, 5.09, 5.09);

Right Cheek Low/Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.008 W/kg

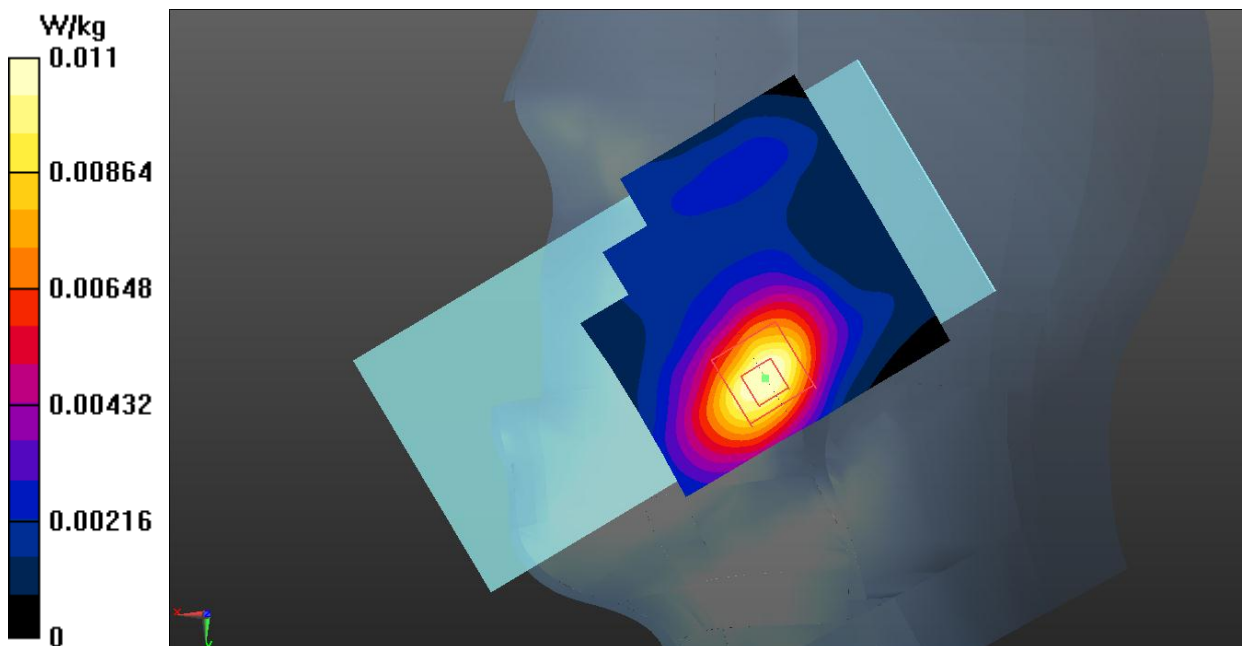
Right Cheek Low/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 1.033 V/m; Power Drift = 0.09 dB

Peak SAR (extrapolated) = 0.035 W/kg

SAR(1 g) = 0.005 W/kg; SAR(10 g) = 0.002 W/kg

Maximum value of SAR (measured) = 0.011 W/kg



GSM1900 Body

Date: 2022-1-28

Electronics: DAE4 Sn786

Medium: Head 1900MHz

Medium parameters used (interpolated): $f = 1850.2$ MHz; $\sigma = 1.374$ S/m; $\epsilon_r = 39.418$; $\rho = 1000$ kg/m³

Communication System: UID 0, GPRS 4Txslot (0) Frequency: 1850.2 MHz Duty Cycle: 1:2

Probe: ES3DV3 – SN3151 ConvF (5.09, 5.09, 5.09);

Rear Side Low/Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.568 W/kg

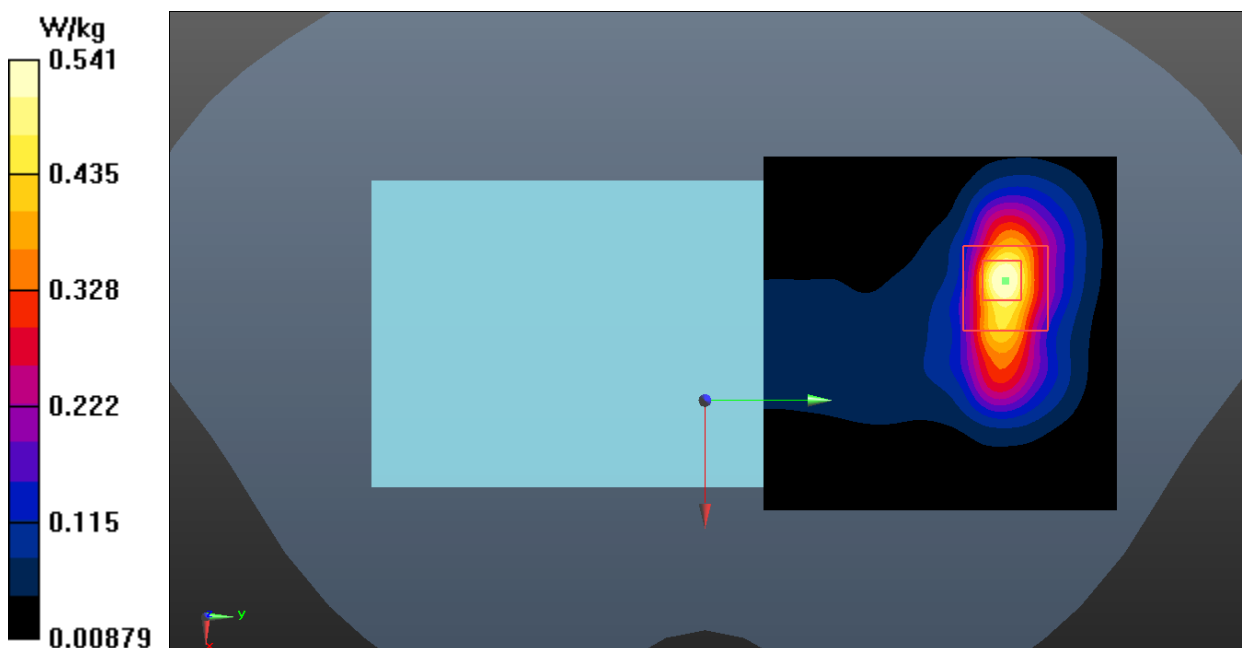
Rear Side Low/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 4.810 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 0.708 W/kg

SAR(1 g) = 0.390 W/kg; SAR(10 g) = 0.203 W/kg

Maximum value of SAR (measured) = 0.541 W/kg



WCDMA Band 2 Head

Date: 2022-1-28

Electronics: DAE4 Sn786

Medium: Head 1900MHz

Medium parameters used: $f = 1880$ MHz; $\sigma = 1.4$ S/m; $\epsilon_r = 39.302$; $\rho = 1000$ kg/m³

Communication System: UID 0, WCDMA (0) Frequency: 1880 MHz Duty Cycle: 1:1

Probe: ES3DV3 – SN3151 ConvF (5.09, 5.09, 5.09);

Right Cheek Middle/Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.153 W/kg

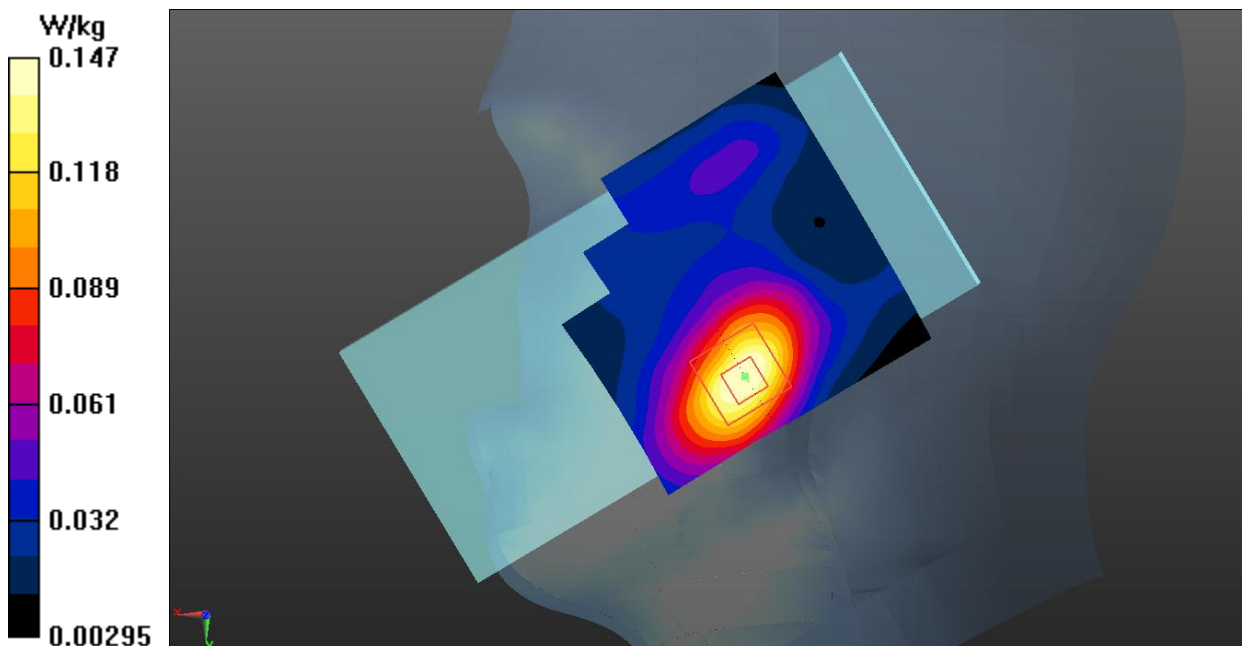
Right Cheek Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 3.173 V/m; Power Drift = -0.14 dB

Peak SAR (extrapolated) = 0.194 W/kg

SAR(1 g) = 0.125 W/kg; SAR(10 g) = 0.076 W/kg

Maximum value of SAR (measured) = 0.147 W/kg



WCDMA Band 2 Body

Date: 2022-1-28

Electronics: DAE4 Sn786

Medium: Head 1900MHz

Medium parameters used: $f = 1880$ MHz; $\sigma = 1.4$ S/m; $\epsilon_r = 39.302$; $\rho = 1000$ kg/m³

Communication System: UID 0, WCDMA (0) Frequency: 1880 MHz Duty Cycle: 1:1

Probe: ES3DV3 – SN3151 ConvF (5.09, 5.09, 5.09);

Rear Side Middle/Area Scan (61x61x1): Interpolated grid: $dx=1.500$ mm, $dy=1.500$ mm

Maximum value of SAR (interpolated) = 0.772 W/kg

Rear Side Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8$ mm, $dy=8$ mm, $dz=5$ mm

Reference Value = 3.832 V/m; Power Drift = 0.12 dB

Peak SAR (extrapolated) = 1.26 W/kg

SAR(1 g) = 0.667 W/kg; SAR(10 g) = 0.334 W/kg

Maximum value of SAR (measured) = 0.798 W/kg

