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Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL at 5200 MHz

Impedance, transformed to feed point	49.5Ω - 9.66jΩ
Return Loss	- 20.3dB

Antenna Parameters with Head TSL at 5300 MHz

Impedance, transformed to feed point	49.8Ω - 7.62jΩ
Return Loss	- 22.4dB

Antenna Parameters with Head TSL at 5500 MHz

Impedance, transformed to feed point	52.3Ω - 5.93jΩ
Return Loss	- 24.2dB

Antenna Parameters with Head TSL at 5600 MHz

Impedance, transformed to feed point	54.8Ω - 3.58jΩ
Return Loss	- 24.9dB

Antenna Parameters with Head TSL at 5800 MHz

Impedance, transformed to feed point	55.3Ω - 5.10jΩ
Return Loss	- 23.2dB

Antenna Parameters with Body TSL at 5200 MHz

Impedance, transformed to feed point	49.4Ω - 7.29jΩ
Return Loss	- 22.7dB

Antenna Parameters with Body TSL at 5300 MHz

Impedance, transformed to feed point	49.5Ω - 5.12jΩ
Return Loss	- 25.7dB

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Antenna Parameters with Body TSL at 5500 MHz

Impedance, transformed to feed point	53.4Ω - 3.50jΩ
Return Loss	- 26.5dB

Antenna Parameters with Body TSL at 5600 MHz

Impedance, transformed to feed point	56.5Ω - 1.54jΩ
Return Loss	- 24.0dB

Antenna Parameters with Body TSL at 5800 MHz

Impedance, transformed to feed point	57.4Ω - 3.09jΩ
Return Loss	- 22.5dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.111 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: 03.23.2021

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1172

Communication System: CW; Frequency: 5200 MHz, Frequency: 5300 MHz, Frequency: 5500 MHz, Frequency: 5600 MHz, Frequency: 5800 MHz,
Medium parameters used: f = 5200 MHz; σ = 4.63 S/m; ε_r = 35.9; ρ = 1000 kg/m^3, Medium parameters used: f = 5300 MHz; σ = 4.74 S/m; ε_r = 35.7; ρ = 1000 kg/m^3, Medium parameters used: f = 5500 MHz; σ = 4.946 S/m; ε_r = 35.38; ρ = 1000 kg/m^3, Medium parameters used: f = 5600 MHz; σ = 5.075 S/m; ε_r = 35.08; ρ = 1000 kg/m^3, Medium parameters used: f = 5800 MHz; σ = 5.262 S/m; ε_r = 34.78; ρ = 1000 kg/m^3,
Phantom section: Center Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3617; ConvF(5.5, 5.5, 5.5) @ 5200 MHz; ConvF(5.3, 5.3, 5.3) @ 5300 MHz; ConvF(5.15, 5.15, 5.15) @ 5500 MHz; ConvF(5, 5, 5) @ 5600 MHz; ConvF(5.02, 5.02, 5.02) @ 5800 MHz; Calibrated: 2021-01-27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn777; Calibrated: 2021-01-08
- 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 (7483)

Dipole Calibration /Pin=100mW, d=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 63.33 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 30.5 W/kg
SAR(1 g) = 7.51 W/kg; SAR(10 g) = 2.16 W/kg
Smallest distance from peaks to all points 3 dB below = 7.5 mm
Ratio of SAR at M2 to SAR at M1 = 65.2%
Maximum value of SAR (measured) = 17.9 W/kg

Dipole Calibration /Pin=100mW, d=10mm, f=5300 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 59.12 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 32.4 W/kg
SAR(1 g) = 7.75 W/kg; SAR(10 g) = 2.23 W/kg
Smallest distance from peaks to all points 3 dB below = 7.2 mm
Ratio of SAR at M2 to SAR at M1 = 64.1%
Maximum value of SAR (measured) = 18.5 W/kg

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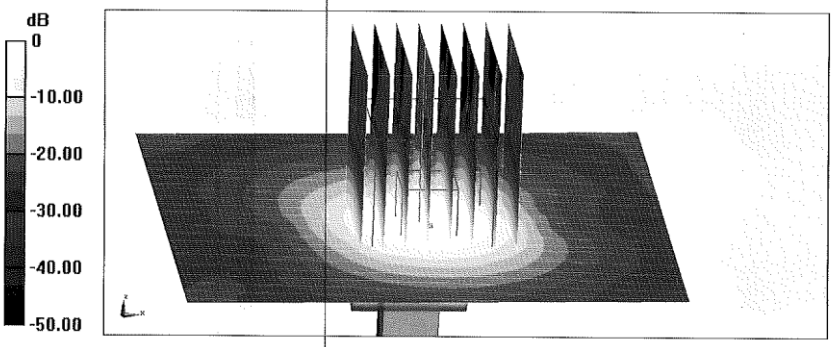
Dipole Calibration /Pin=100mW, d=10mm, f=5500 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 63.60 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 35.7 W/kg
SAR(1 g) = 8.21 W/kg; SAR(10 g) = 2.31 W/kg
Smallest distance from peaks to all points 3 dB below = 7.2 mm
Ratio of SAR at M2 to SAR at M1 = 62.8%
Maximum value of SAR (measured) = 20.0 W/kg

Dipole Calibration /Pin=100mW, d=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 62.85 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 36.1 W/kg
SAR(1 g) = 8.12 W/kg; SAR(10 g) = 2.33 W/kg
Smallest distance from peaks to all points 3 dB below = 7.4 mm
Ratio of SAR at M2 to SAR at M1 = 62.1%
Maximum value of SAR (measured) = 19.9 W/kg

Dipole Calibration /Pin=100mW, d=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 61.46 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 35.8 W/kg
SAR(1 g) = 7.86 W/kg; SAR(10 g) = 2.24 W/kg
Smallest distance from peaks to all points 3 dB below = 7.4 mm
Ratio of SAR at M2 to SAR at M1 = 61.3%
Maximum value of SAR (measured) = 19.5 W/kg



0 dB = 19.5 W/kg = 12.90 dBW/kg

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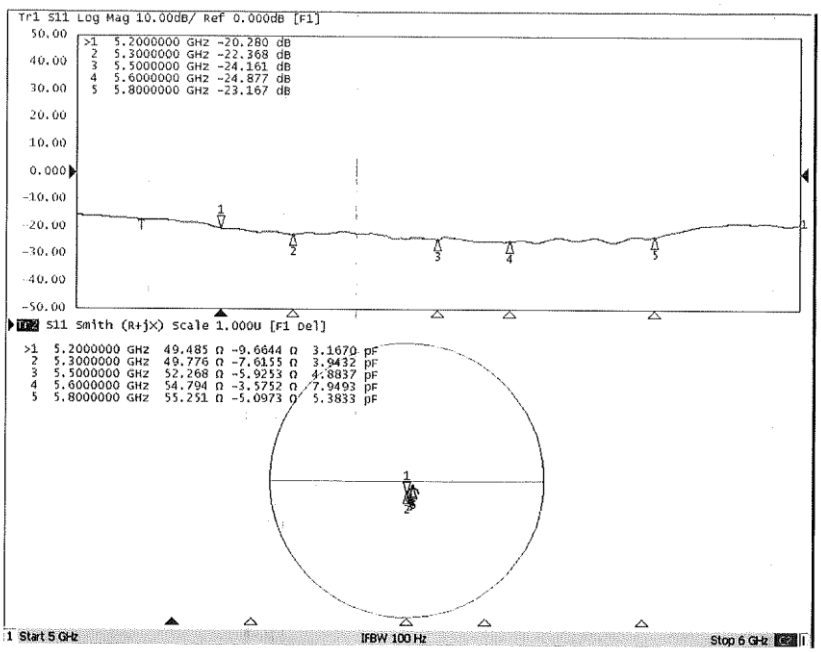
Impedance Measurement Plot for Head TSL



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DASY5 Validation Report for Body TSL Date: 03.22.2021

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1172

Communication System: CW; Frequency: 5200 MHz, Frequency: 5300 MHz, Frequency: 5500 MHz, Frequency: 5600 MHz, Frequency: 5800 MHz,

Medium parameters used: f = 5200 MHz; σ = 5.277 S/m; ε_r = 49.12; ρ = 1000 kg/m^3, Medium parameters used: f = 5300 MHz; σ = 5.406 S/m; ε_r = 48.96; ρ = 1000 kg/m^3, Medium parameters used: f = 5500 MHz; σ = 5.672 S/m; ε_r = 48.59; ρ = 1000 kg/m^3, Medium parameters used: f = 5600 MHz; σ = 5.817 S/m; ε_r = 48.37; ρ = 1000 kg/m^3, Medium parameters used: f = 5800 MHz; σ = 6.162 S/m; ε_r = 47.93; ρ = 1000 kg/m^3,

Phantom section: Right Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3617; ConvF(4.85, 4.85, 4.85) @ 5200 MHz; ConvF(4.65, 4.65, 4.65) @ 5300 MHz; ConvF(4.35, 4.35, 4.35) @ 5500 MHz; ConvF(4.25, 4.25, 4.25) @ 5600 MHz; ConvF(4.27, 4.27, 4.27) @ 5800 MHz; Calibrated: 2021-01-27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn777; Calibrated: 2021-01-08
- 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 (7483)

Dipole Calibration /Pin=100mW, d=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 65.63 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 27.4 W/kg
SAR(1 g) = 7.08 W/kg; SAR(10 g) = 1.98 W/kg
Smallest distance from peaks to all points 3 dB below = 7.2 mm
Ratio of SAR at M2 to SAR at M1 = 66.4%
Maximum value of SAR (measured) = 16.4 W/kg

Dipole Calibration /Pin=100mW, d=10mm, f=5300 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 66.93 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 29.2 W/kg
SAR(1 g) = 7.37 W/kg; SAR(10 g) = 2.08 W/kg
Smallest distance from peaks to all points 3 dB below = 7.2 mm
Ratio of SAR at M2 to SAR at M1 = 65.6%
Maximum value of SAR (measured) = 17.1 W/kg

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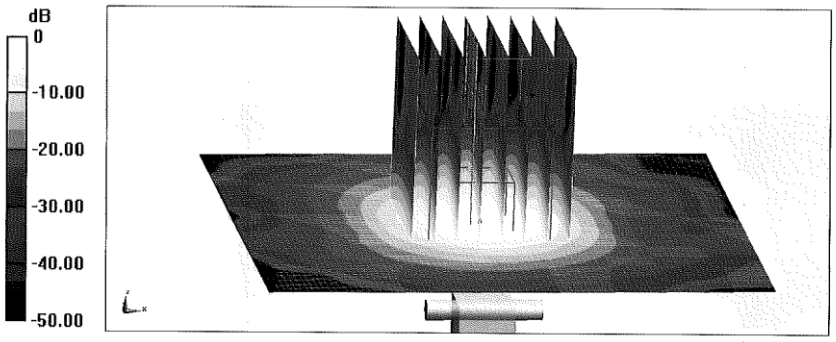
Dipole Calibration /Pin=100mW, d=10mm, f=5500 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 67.31 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 32.2 W/kg
SAR(1 g) = 7.65 W/kg; SAR(10 g) = 2.13 W/kg
Smallest distance from peaks to all points 3 dB below = 7.2 mm
Ratio of SAR at M2 to SAR at M1 = 63.5%
Maximum value of SAR (measured) = 18.2 W/kg

Dipole Calibration /Pin=100mW, d=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 66.81 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 33.6 W/kg
SAR(1 g) = 7.65 W/kg; SAR(10 g) = 2.13 W/kg
Smallest distance from peaks to all points 3 dB below = 7.2 mm
Ratio of SAR at M2 to SAR at M1 = 62.4%
Maximum value of SAR (measured) = 19.0 W/kg

Dipole Calibration /Pin=100mW, d=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 68.05 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 33.8 W/kg
SAR(1 g) = 7.24 W/kg; SAR(10 g) = 2 W/kg
Smallest distance from peaks to all points 3 dB below = 7.2 mm
Ratio of SAR at M2 to SAR at M1 = 60.9%
Maximum value of SAR (measured) = 18.1 W/kg



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

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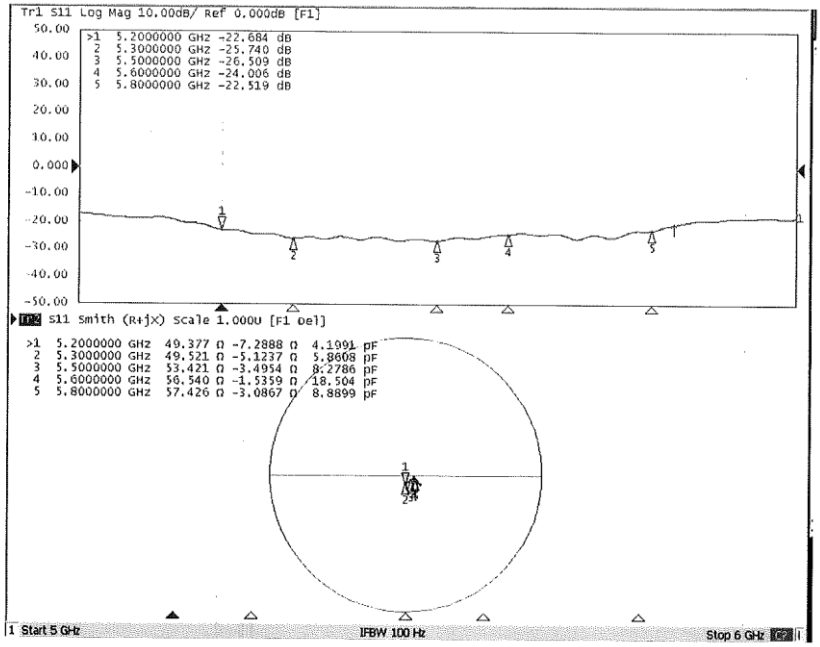
Impedance Measurement Plot for Body TSL



Annex E: Accreditation Certificate

Accredited Laboratory

A2LA has accredited

INDUSTRIAL INTERNET INNOVATION CENTER (SHANGHAI) CO., LTD.

Shanghai, People's Republic of China

for technical competence in the field of

Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 *General requirements for the competence of testing and calibration laboratories*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated April 2017*).

Presented this 12th day of April 2021.

Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 3682.01
Valid to February 28, 2023

For the tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.

************END OF REPORT************