

Appendix A

Detailed System Validation Results

1. System Performance Check
System Performance Check 835 MHz Head
System Performance Check 835 MHz Body
System Performance Check 1800 MHz Head
System Performance Check 1800 MHz Body
System Performance Check 1900 MHz Head
System Performance Check 1900 MHz Body
System Performance Check 2300 MHz Head
System Performance Check 2300 MHz Body
System Performance Check 2450 MHz Head
System Performance Check 2450 MHz Body
System Performance Check 2600 MHz Head
System Performance Check 2600 MHz Body

Date: 2019-06-24

Test Laboratory: Compliance Certification Services Inc.

System Performance Check-Head 835MHz

DUT: Dipole 835 MHz D835V2; Type: D835V2; Serial: 4d166

Communication System: UID 0, CW; Frequency: 835 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 835$ MHz; $\sigma = 0.887$ S/m; $\epsilon_r = 40.842$; $\rho = 1000$ kg/m³
Phantom section: Flat Section
Measurement Standard: DASYS (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

- Probe: EX3DV4 - SN3798; ConvF(9.46, 9.46, 9.46); Calibrated: 2019-05-24;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), $z = 1.0, 31.0$
- Electronics: DAE4 Sn1245; Calibrated: 2019-05-21
- Phantom: Twin SAM Phantom; Type: QD 000 P40 CD; Serial: 1609
- DASYS 52.8.8(1222); SEMCAD X 14.6.10(7331)

Body/Pin=250 mW, dist=15 mm (EX-Probe)/Area Scan (7x12x1):

Measurement grid: $dx=15$ mm, $dy=15$ mm
Maximum value of SAR (measured) = 2.87 W/kg

Body/Pin=250 mW, dist=15 mm (EX-Probe)/Zoom Scan (7x7x7)

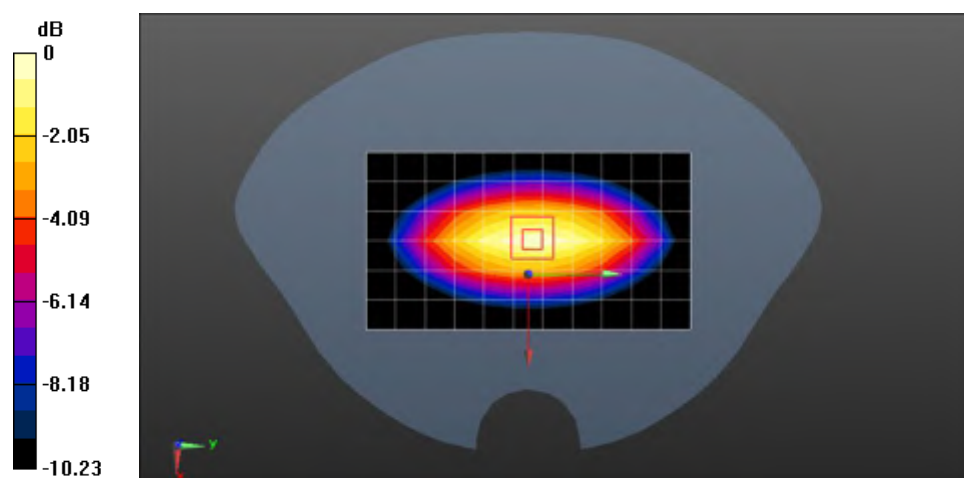
(7x7x7)/Cube 0: Measurement grid: $dx=5$ mm, $dy=5$ mm, $dz=5$ mm

Reference Value = 58.61 V/m; Power Drift = 0.06 dB

Peak SAR (extrapolated) = 3.46 W/kg

SAR(1 g) = 2.35 W/kg; SAR(10 g) = 1.55 W/kg

Maximum value of SAR (measured) = 2.95 W/kg



0 dB = 2.95 W/kg = 4.70 dBW/kg

Date: 2019-06-24

Test Laboratory: Compliance Certification Services Inc.

System Performance Check-Body 835MHz

DUT: Dipole 835 MHz D835V2; Type: D835V2; Serial: 4d166

Communication System: UID 0, CW; Frequency: 835 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 835$ MHz; $\sigma = 1.012$ S/m; $\epsilon_r = 54.425$; $\rho = 1000$ kg/m³
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

- Probe: EX3DV4 - SN3798; ConvF(9.33, 9.33, 9.33); Calibrated: 2019-05-24;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), $z = 1.0, 31.0$
- Electronics: DAE4 Sn1245; Calibrated: 2019-05-21
- Phantom: ELI v4.0; Type: QDOVA001BB; Serial: TP:1102
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Body/dist=15mm, Pin=250 mW(EX-Probe)/Area Scan (7x12x1):

Measurement grid: $dx=15$ mm, $dy=15$ mm
Maximum value of SAR (measured) = 3.54 W/kg

Body/dist=15mm, Pin=250 mW(EX-Probe)/Zoom Scan (7x7x7)

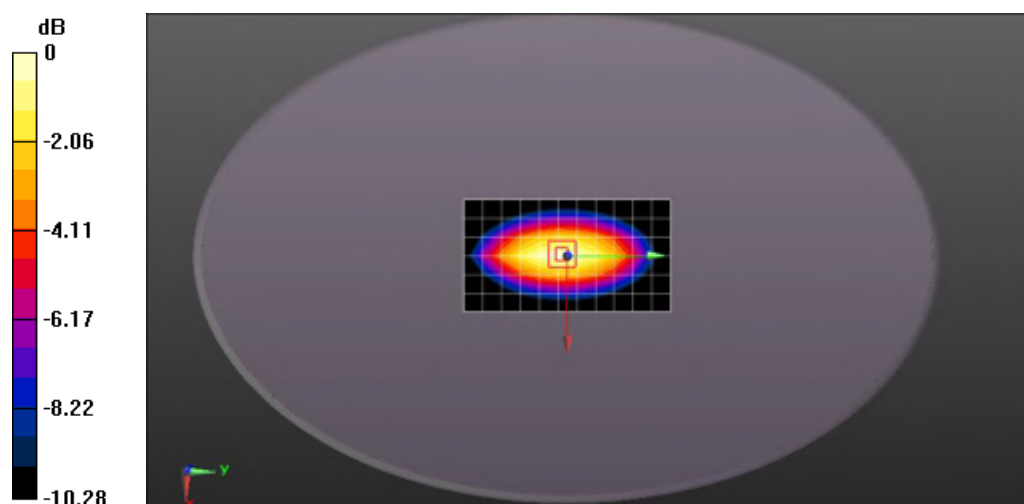
(7x7x7)/Cube 0: Measurement grid: $dx=5$ mm, $dy=5$ mm, $dz=5$ mm

Reference Value = 60.91 V/m; Power Drift = -0.10 dB

Peak SAR (extrapolated) = 4.20 W/kg

SAR(1 g) = 2.45 W/kg; SAR(10 g) = 1.64 W/kg

Maximum value of SAR (measured) = 3.56 W/kg



0 dB = 3.56 W/kg = 5.51 dBW/kg

Date: 2019-06-25

Test Laboratory: Compliance Certification Services Inc.

System Performance Check-Head 1800MHz

DUT: Dipole 1800 MHz D1800V2; Type: D1800V2; Serial: D1800V2 - SN:2d052

Communication System: UID 10000, CW; Frequency: 1800 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 1800$ MHz; $\sigma = 1.367$ S/m; $\epsilon_r = 40.307$; $\rho = 1000$ kg/m³
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

- Probe: EX3DV4 - SN3798; ConvF(8, 8, 8); Calibrated: 2019-05-24;
- Sensor-Surface: 3mm (Mechanical Surface Detection), $z = 1.0, 31.0$
- Electronics: DAE4 Sn1245; Calibrated: 2019-05-21
- Phantom: Twin SAM Phantom; Type: QD 000 P40 CD; Serial: 1609
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Body/d=10mm, Pin=250 mW,(EX-Probe)/Area Scan (7x7x1):

Measurement grid: $dx=15$ mm, $dy=15$ mm

Maximum value of SAR (measured) = 9.09 W/kg

Body/d=10mm, Pin=250 mW,(EX-Probe)/Zoom Scan (7x7x7)

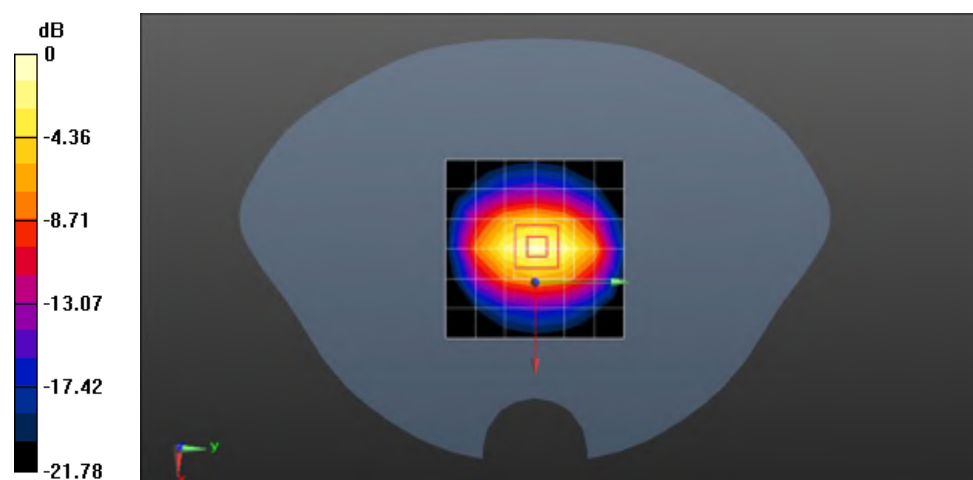
(7x7x7)/Cube 0: Measurement grid: $dx=5$ mm, $dy=5$ mm, $dz=5$ mm

Reference Value = 81.94 V/m; Power Drift = 0.06 dB

Peak SAR (extrapolated) = 17.4 W/kg

SAR(1 g) = 8.99 W/kg; SAR(10 g) = 4.91 W/kg

Maximum value of SAR (measured) = 10.6 W/kg



0 dB = 10.6 W/kg = 10.25 dBW/kg

Date: 2019-06-23

Test Laboratory: Compliance Certification Services Inc.

System Performance Check-Body 1800MHz

DUT: Dipole 1800 MHz D1800V2; Type: D1800V2; Serial: D1800V2 - SN:2d052

Communication System: UID 10000, CW; Frequency: 1800 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 1800$ MHz; $\sigma = 1.481$ S/m; $\epsilon_r = 51.142$; $\rho = 1000$ kg/m³
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

- Probe: EX3DV4 - SN3798; ConvF(7.81, 7.81, 7.81); Calibrated: 2019-05-24;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), $z = 1.0, 31.0$
- Electronics: DAE4 Sn1245; Calibrated: 2019-05-21
- Phantom: ELI v4.0; Type: QDOVA001BB; Serial: TP:1102
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Body/d=10mm, Pin=250 mW, dist=2.0mm (EX-Probe) (23.6 dBm)/Area

Scan (7x7x1): Measurement grid: $dx=15$ mm, $dy=15$ mm

Maximum value of SAR (measured) = 13.5 W/kg

Body/d=10mm, Pin=250 mW, dist=2.0mm (EX-Probe) (23.6 dBm)/Zoom

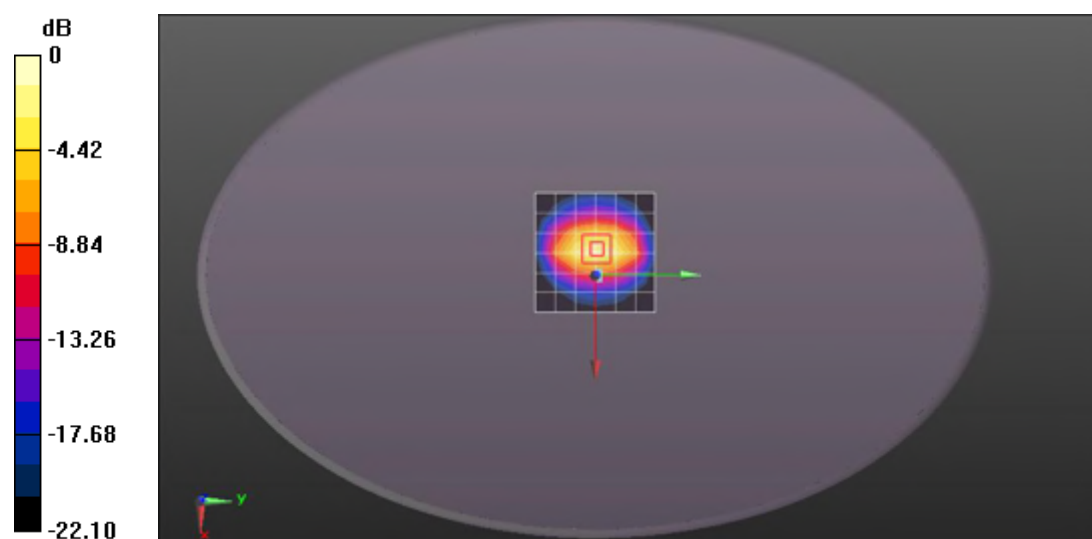
Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: $dx=5$ mm, $dy=5$ mm, $dz=5$ mm

Reference Value = 108.7 V/m; Power Drift = -0.10 dB

Peak SAR (extrapolated) = 21.4 W/kg

SAR(1 g) = 9.97 W/kg; SAR(10 g) = 4.8 W/kg

Maximum value of SAR (measured) = 16.9 W/kg



0 dB = 16.9 W/kg = 12.28 dBW/kg

Test Laboratory: Compliance Certification Services Inc.

System Performance Check-Head 1900MHz

DUT: Dipole 1900 MHz D1900V2; Type: D1900V2; Serial: 5d018

Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 1900$ MHz; $\sigma = 1.372$ S/m; $\epsilon_r = 40.64$; $\rho = 1000$ kg/m³
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

- Probe: EX3DV4 - SN3798; ConvF(7.9, 7.9, 7.9); Calibrated: 2019-05-24;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), $z = 1.0, 31.0$
- Electronics: DAE4 Sn1245; Calibrated: 2019-05-21
- Phantom: Twin SAM Phantom; Type: QD 000 P40 CD; Serial: 1609
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Body/Pin=250 mW, dist=10mm (EX-Probe)/Area Scan (7x8x1):

Measurement grid: $dx=15$ mm, $dy=15$ mm

Maximum value of SAR (measured) = 16.1 W/kg

Body/Pin=250 mW, dist=10mm (EX-Probe)/Zoom Scan (7x7x7)

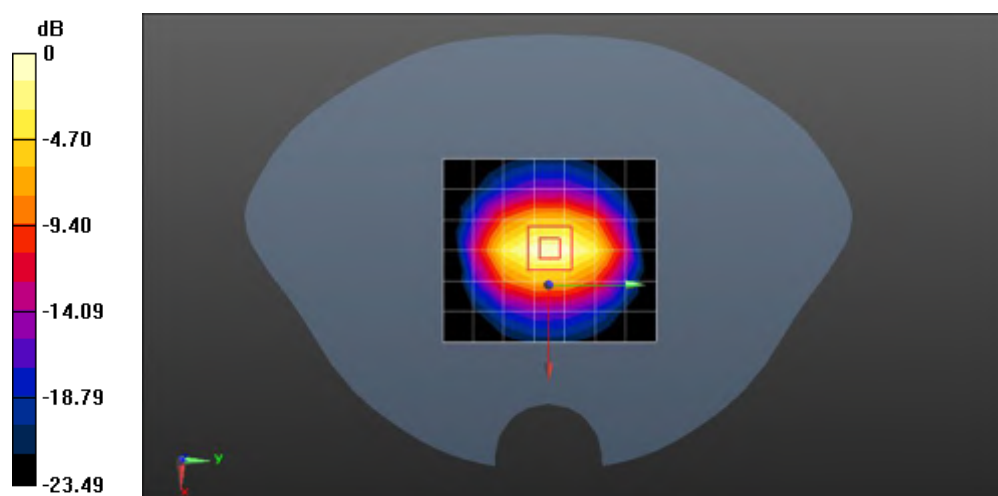
(7x7x7)/Cube 0: Measurement grid: $dx=5$ mm, $dy=5$ mm, $dz=5$ mm

Reference Value = 115.3 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 25.3 W/kg

SAR(1 g) = 10.8 W/kg; SAR(10 g) = 5.22 W/kg

Maximum value of SAR (measured) = 17.7 W/kg



0 dB = 17.7 W/kg = 12.48 dBW/kg

Date: 2019-06-23

Test Laboratory: Compliance Certification Services Inc.

System Performance Check-Body 1900MHz

DUT: Dipole 1900 MHz D1900V2; Type: D1900V2; Serial: 5d018

Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 1900$ MHz; $\sigma = 1.513$ S/m; $\epsilon_r = 53.826$; $\rho = 1000$ kg/m³
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

- Probe: EX3DV4 - SN3798; ConvF(7.66, 7.66, 7.66); Calibrated: 2019-05-24;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), $z = 1.0, 31.0$
- Electronics: DAE4 Sn1245; Calibrated: 2019-05-21
- Phantom: ELI v4.0; Type: QDOVA001BB; Serial: TP:1102
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Body/Pin=250 mW, dist=10mm (EX-Probe)/Area Scan (7x8x1):

Measurement grid: $dx=15$ mm, $dy=15$ mm

Maximum value of SAR (measured) = 12.8 W/kg

Body/Pin=250 mW, dist=10mm (EX-Probe)/Zoom Scan (7x7x7)

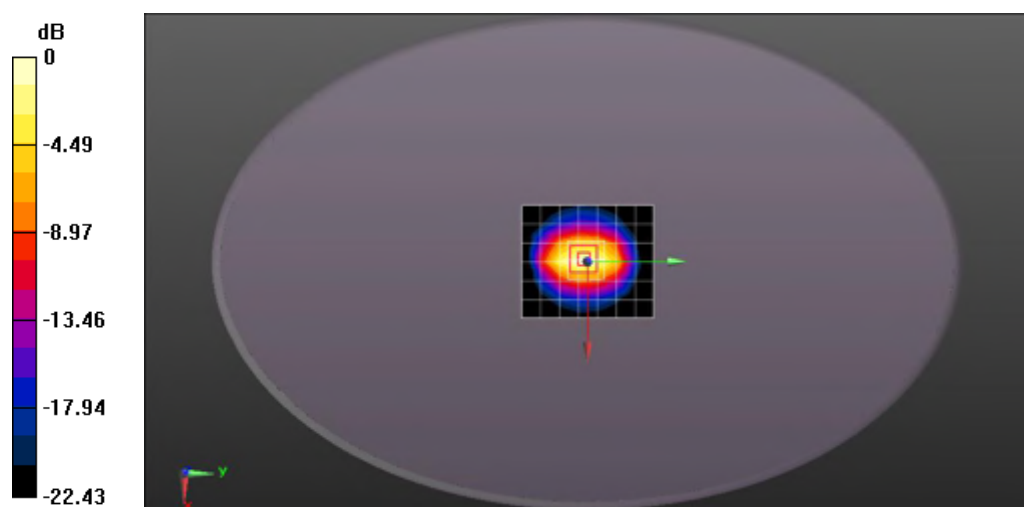
(7x7x7)/Cube 0: Measurement grid: $dx=5$ mm, $dy=5$ mm, $dz=5$ mm

Reference Value = 94.53 V/m; Power Drift = 0.06 dB

Peak SAR (extrapolated) = 19.0 W/kg

SAR(1 g) = 9.76 W/kg; SAR(10 g) = 5.14 W/kg

Maximum value of SAR (measured) = 13.6 W/kg



Test Laboratory: Compliance Certification Services Inc.

System Performance Check-Head 2300MHz

DUT: Dipole 2300 MHz D2300V2; Type: D2300V2; Serial: 1096

Communication System: UID 0, CW (0); Frequency: 2300 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 2300$ MHz; $\sigma = 1.645$ S/m; $\epsilon_r = 40.475$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

- Probe: EX3DV4 - SN3798; ConvF(7.61, 7.61, 7.61); Calibrated: 2019-05-24;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), $z = 1.0, 31.0$
- Electronics: DAE4 Sn1245; Calibrated: 2019-05-21
- Phantom: Twin SAM Phantom; Type: QD 000 P40 CD; Serial: 1609
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Body/Pin=250 mW, dist=10mm (EX-Probe)/Area Scan (9x10x1):

Measurement grid: $dx=12$ mm, $dy=12$ mm

Maximum value of SAR (measured) = 15.3 W/kg

Body/Pin=250 mW, dist=10mm (EX-Probe)/Zoom Scan (7x7x7)

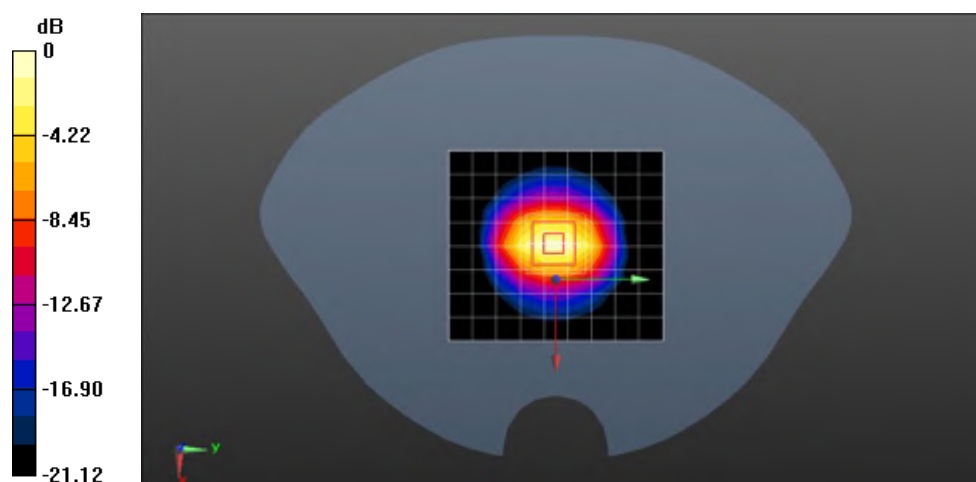
(7x7x7)/Cube 0: Measurement grid: $dx=5$ mm, $dy=5$ mm, $dz=5$ mm

Reference Value = 100.5 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 22.0 W/kg

SAR(1 g) = 10.8 W/kg; SAR(10 g) = 5.16 W/kg

Maximum value of SAR (measured) = 16.4 W/kg



0 dB = 16.4 W/kg = 12.15 dBW/kg

Date: 2019-06-22

Test Laboratory: Compliance Certification Services Inc.

System Performance Check-Body 2300MHz

DUT: Dipole 2300 MHz D2300V2; Type: D2300V2; Serial: 1096

Communication System: UID 0, CW (0); Frequency: 2300 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 2300$ MHz; $\sigma = 1.776$ S/m; $\epsilon_r = 53.158$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

- Probe: EX3DV4 - SN3798; ConvF(7.49, 7.49, 7.49); Calibrated: 2019-05-24;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), $z = 1.0, 31.0$
- Electronics: DAE4 Sn1245; Calibrated: 2019-05-21
- Phantom: ELI v4.0; Type: QDOVA001BB; Serial: TP:1102
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Body/d=10mm, Pin=250 mW, dist=2.0mm (EX-Probe)/Area Scan

(8x9x1): Measurement grid: $dx=12$ mm, $dy=12$ mm

Maximum value of SAR (measured) = 11.3 W/kg

Body/d=10mm, Pin=250 mW, dist=2.0mm (EX-Probe)/Zoom Scan

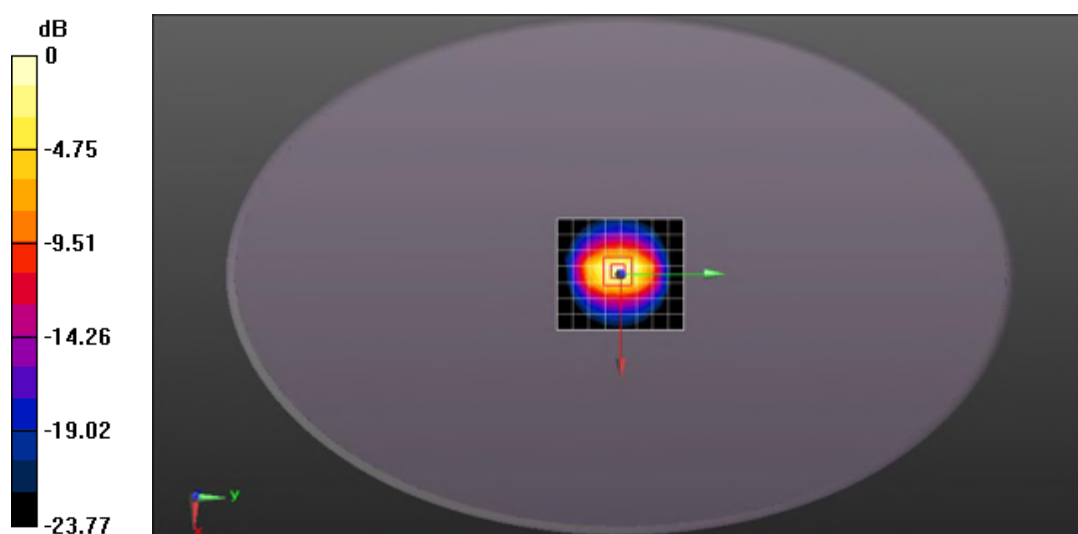
(7x7x7) (7x7x7)/Cube 0: Measurement grid: $dx=5$ mm, $dy=5$ mm, $dz=5$ mm

Reference Value = 85.30 V/m; Power Drift = 0.06 dB

Peak SAR (extrapolated) = 17.8 W/kg

SAR(1 g) = 10.9 W/kg; SAR(10 g) = 5.4 W/kg

Maximum value of SAR (measured) = 13.0 W/kg



0 dB = 13.0 W/kg = 11.14 dBW/kg

Date: 2019-06-21

Test Laboratory: Compliance Certification Services Inc.

System Performance Check-Head 2450MHz

DUT: Dipole 2450 MHz D2450V2; Type: D2450V2; Serial: 903

Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 2450$ MHz; $\sigma = 1.826$ S/m; $\epsilon_r = 39.901$; $\rho = 1000$ kg/m³
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

- Probe: EX3DV4 - SN3798; ConvF(7.24, 7.24, 7.24); Calibrated: 2019-05-24;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), $z = 1.0, 31.0$
- Electronics: DAE4 Sn1245; Calibrated: 2019-05-21
- Phantom: Twin SAM Phantom; Type: QD 000 P40 CD; Serial: 1609
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Body/Pin=250 mW, dist=10mm (EX-Probe)/Area Scan (9x10x1):

Measurement grid: $dx=12$ mm, $dy=12$ mm
Maximum value of SAR (measured) = 17.8 W/kg

Body/Pin=250 mW, dist=10mm (EX-Probe)/Zoom Scan (7x7x7)

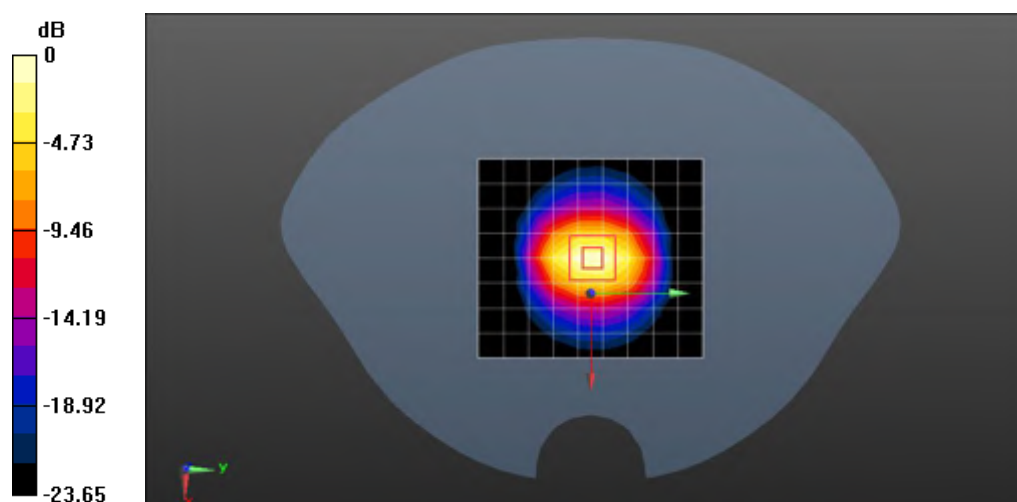
(7x7x7)/Cube 0: Measurement grid: $dx=5$ mm, $dy=5$ mm, $dz=5$ mm

Reference Value = 104.8 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 26.7 W/kg

SAR(1 g) = 12.3 W/kg; SAR(10 g) = 5.53 W/kg

Maximum value of SAR (measured) = 19.3 W/kg



0 dB = 19.3 W/kg = 12.86 dBW/kg

Date: 2019-06-22

Test Laboratory: Compliance Certification Services Inc.

System Performance Check-Body 2450MHz

DUT: Dipole 2450 MHz D2450V2; Type: D24500V2; Serial: 903

Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 2450$ MHz; $\sigma = 1.97$ S/m; $\epsilon_r = 52.693$; $\rho = 1000$ kg/m³
Phantom section: Flat Section
Measurement Standard: DASYS (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

- Probe: EX3DV4 - SN3798; ConvF(7.37, 7.37, 7.37); Calibrated: 2019-05-24;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), $z = 1.0, 31.0$
- Electronics: DAE4 Sn1245; Calibrated: 2019-05-21
- Phantom: ELI v4.0; Type: QDOVA001BB; Serial: TP:1102
- DASYS 52.8.8(1222); SEMCAD X 14.6.10(7331)

Body/Pin=250 mW, dist=10mm (EX-Probe)/Area Scan (9x10x1):

Measurement grid: $dx=12$ mm, $dy=12$ mm

Maximum value of SAR (measured) = 18.5 W/kg

Body/Pin=250 mW, dist=10mm (EX-Probe)/Zoom Scan (7x7x7)

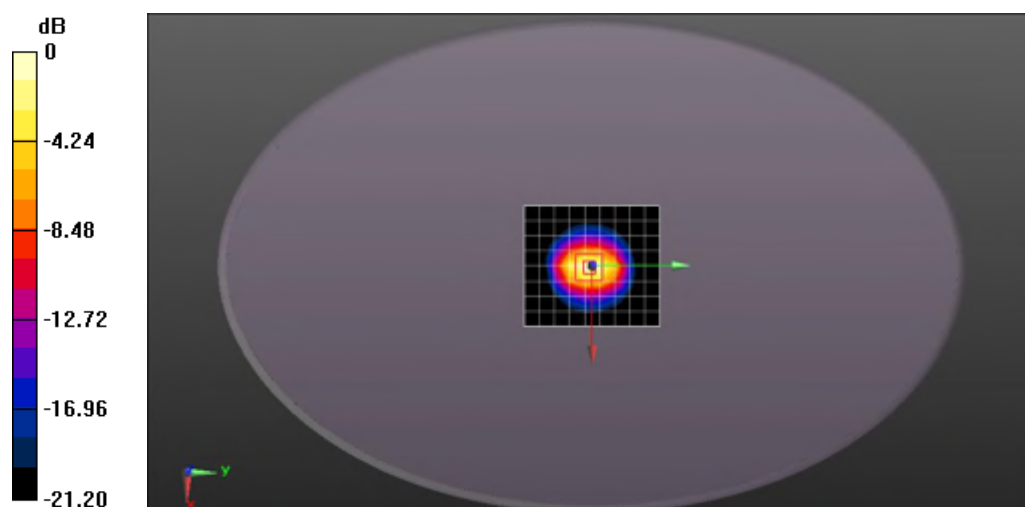
(7x7x7)/Cube 0: Measurement grid: $dx=5$ mm, $dy=5$ mm, $dz=5$ mm

Reference Value = 101.2 V/m; Power Drift = -0.11 dB

Peak SAR (extrapolated) = 26.1 W/kg

SAR(1 g) = 13 W/kg; SAR(10 g) = 6.06 W/kg

Maximum value of SAR (measured) = 19.7 W/kg



0 dB = 19.7 W/kg = 12.94 dBW/kg

Date: 2019-06-21

Test Laboratory: Compliance Certification Services Inc.

System Performance Check-Head 2600MHz

DUT: Dipole 2600 MHz D2600V2; Type: D2600V2; Serial: 1158

Communication System: UID 0, CW (0); Frequency: 2600 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 2600$ MHz; $\sigma = 2$ S/m; $\epsilon_r = 39.388$; $\rho = 1000$ kg/m³
Phantom section: Flat Section
Measurement Standard: DASYS (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

- Probe: EX3DV4 - SN3798; ConvF(7.11, 7.11, 7.11); Calibrated: 2019-05-24;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), $z = 1.0, 31.0$
- Electronics: DAE4 Sn1245; Calibrated: 2019-05-21
- Phantom: Twin SAM Phantom; Type: QD 000 P40 CD; Serial: 1609
- DASYS 52.8.8(1222); SEMCAD X 14.6.10(7331)

Body/Pin=250 mW, dist=10mm (EX-Probe)/Area Scan (9x10x1):

Measurement grid: $dx=12$ mm, $dy=12$ mm

Maximum value of SAR (measured) = 19.6 W/kg

Body/Pin=250 mW, dist=10mm (EX-Probe)/Zoom Scan (7x7x7)

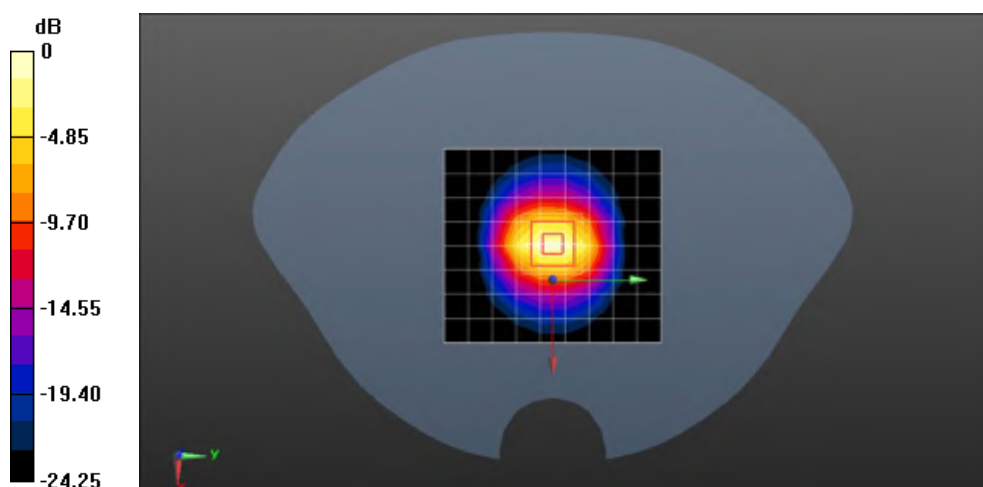
(7x7x7)/Cube 0: Measurement grid: $dx=5$ mm, $dy=5$ mm, $dz=5$ mm

Reference Value = 105.6 V/m; Power Drift = 0.11 dB

Peak SAR (extrapolated) = 30.4 W/kg

SAR(1 g) = 13.8 W/kg; SAR(10 g) = 6.06 W/kg

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



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

Date: 2019-06-22

Test Laboratory: Compliance Certification Services Inc.

System Performance Check-Body 2600MHz

DUT: Dipole 2600 MHz D2600V2; Type: D2600V2; Serial: 1158

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

Medium parameters used: $f = 2600$ MHz; $\sigma = 2.162$ S/m; $\epsilon_r = 52.234$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

- Probe: EX3DV4 - SN3798; ConvF(7.09, 7.09, 7.09); Calibrated: 2019-05-24;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), $z = 1.0, 31.0$
- Electronics: DAE4 Sn1245; Calibrated: 2019-05-21
- Phantom: ELI v4.0; Type: QDOVA001BB; Serial: TP:1102
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Body/d=10mm, Pin=250 mW, dist=2.0mm (EX-Probe)/Area Scan

(8x9x1): Measurement grid: $dx=12$ mm, $dy=12$ mm

Maximum value of SAR (measured) = 17.3 W/kg

Body/d=10mm, Pin=250 mW, dist=2.0mm (EX-Probe)/Zoom Scan

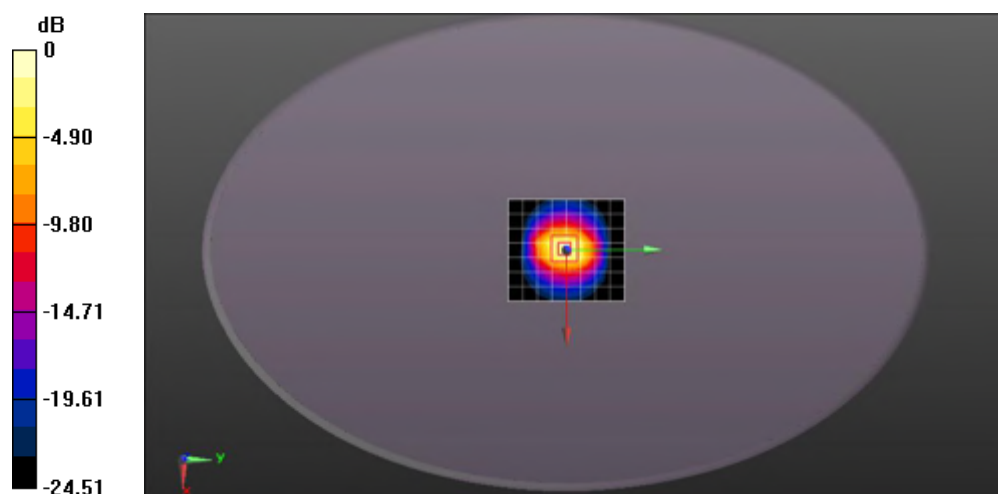
(7x7x7) (7x7x7)/Cube 0: Measurement grid: $dx=5$ mm, $dy=5$ mm, $dz=5$ mm

Reference Value = 102.4 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 30.3 W/kg

SAR(1 g) = 14 W/kg; SAR(10 g) = 6.15 W/kg

Maximum value of SAR (measured) = 21.7 W/kg



0 dB = 21.7 W/kg = 13.36 dBW/kg