

SAR Test Report

Part 2 of 3

Project Number: 5209337**Quotation Number:** SUW-202308005164**Report Number:** 5209337EMC03**Revision Level:** 0**Client:** Persistent Systems, LLC**Equipment Under Test:** Wave Relay® MANET System**Model Number:** MPU5 with RF-2150 Radio Module**FCC ID:** 2AG3JRF-2150**Applicable Standards:** IEC 62209-1528

47 CFR §§ 2.1093

KDB 447498, KDB 865664, KDB 248227

Report issued on: 21 October 2024**Test Result:** Compliant

FOR THE SCOPE OF ACCREDITATION UNDER CERTIFICATE NUMBER: 3212.01

This report must not be used by the client to claim product certification, approval, or endorsement by A2LA, NIST, or any agency of the Federal Government.

Tested / Evaluated by:

A handwritten signature in blue ink, appearing to read 'P. Lorenzo'.

Paul Lorenzo, Senior EMC Technician

Reviewed by:

A handwritten signature in blue ink, appearing to read 'Stephen C. Whalen'.

Stephen C. Whalen, EMC/RF Exposure Manager

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'APPENDIX A - PHOTOS OF EUT AND TEST POSITION(S)

EUT Standalone

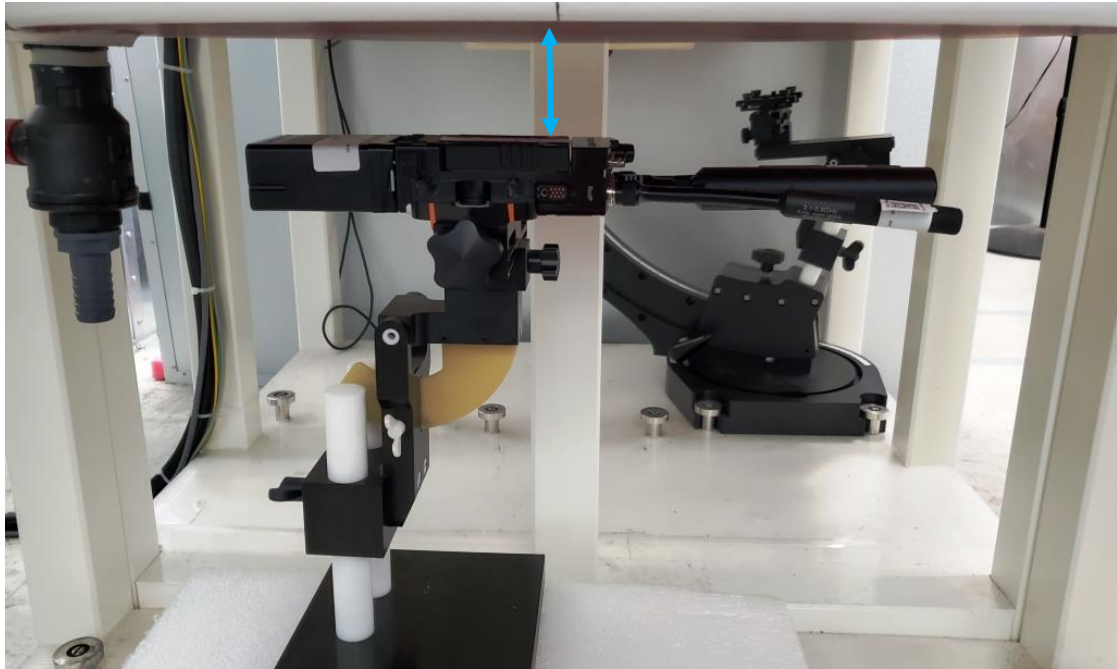
Front



Back



EUT Test Position
Front Facing Phantom @ 50mm



Back Facing Phantom @ 50mm



APPENDIX B – SAR DATA

Test Laboratory: SGS SAR Laboratory North America

Date/Time: 9/26/2024 9:31:36 AM

Plot #1

DUT: RF 2150 Back Chain 1

DASY5 Configuration:

- Communication System: UID 10012 - CAB, IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps); Frequency: 2472 MHz;
- Probe: ES3DV3 - SN3272; ConvF(4.52, 4.52, 4.52) @ 2472 MHz; Calibrated: 2/26/2024
- Medium parameters used: $f = 2472$ MHz; $\sigma = 1.768$ S/m; $\epsilon_r = 37.203$; $\rho = 1000$ kg/m³; Phantom: ELI v5.0; Phantom section: Flat Section
- Electronics: DAE4 Sn1287; Calibrated: 2/19/2024
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

2-3GHz Body/Body Scan/Area Scan 2 (101x251x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm

Reference Value = 17.07 V/m; Power Drift = -0.21 dB

Fast SAR: SAR(1 g) = 0.488 W/kg; SAR(10 g) = 0.289 W/kg (SAR corrected for target medium)

Maximum value of SAR (interpolated) = 0.588 W/kg

2-3GHz Body/Body Scan/Zoom Scan (8x8x8)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 17.07 V/m; Power Drift = -0.21 dB

Peak SAR (extrapolated) = 0.809 W/kg

SAR(1 g) = 0.483 W/kg; SAR(10 g) = 0.296 W/kg (SAR corrected for target medium)

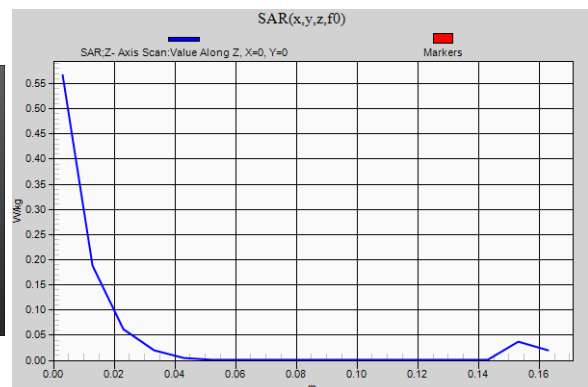
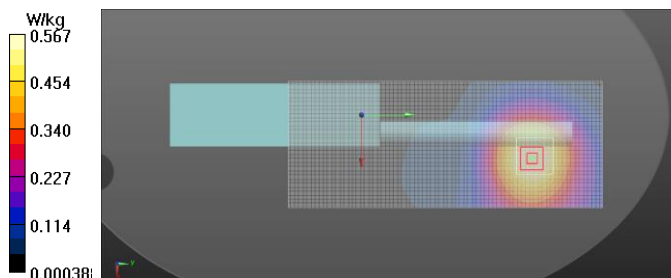
Smallest distance from peaks to all points 3 dB below: Larger than measurement grid

Ratio of SAR at M2 to SAR at M1 = 57.5%

Maximum value of SAR (measured) = 0.576 W/kg

2-3GHz Body/Body Scan/Z- Axis Scan (1x1x17): Measurement grid: dx=20mm, dy=20mm, dz=10mm

Maximum value of SAR (measured) = 0.567 W/kg



Test Laboratory: SGS SAR Laboratory North America

Date/Time: 9/26/2024 3:52:32 PM

Plot #2

DUT: RF 2150 Back Chain 1

DASY5 Configuration:

- Communication System: UID 10012 - CAB, IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps); Frequency: 2472 MHz;
- Probe: ES3DV3 - SN3272; ConvF(4.52, 4.52, 4.52) @ 2472 MHz; Calibrated: 2/26/2024
- Medium parameters used: $f = 2472$ MHz; $\sigma = 1.768$ S/m; $\epsilon_r = 37.203$; $\rho = 1000$ kg/m³; Phantom: ELI v5.0; Phantom section: Flat Section
- Electronics: DAE4 Sn1287; Calibrated: 2/19/2024
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

2-3GHz Body/Body Scan/Area Scan (101x251x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm

Reference Value = 12.40 V/m; Power Drift = 0.29 dB

Fast SAR: SAR(1 g) = 0.262 W/kg; SAR(10 g) = 0.157 W/kg (SAR corrected for target medium)

Maximum value of SAR (interpolated) = 0.316 W/kg

2-3GHz Body/Body Scan/Zoom Scan (9x8x8)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 12.40 V/m; Power Drift = 0.29 dB

Peak SAR (extrapolated) = 0.459 W/kg

SAR(1 g) = 0.272 W/kg; SAR(10 g) = 0.166 W/kg (SAR corrected for target medium)

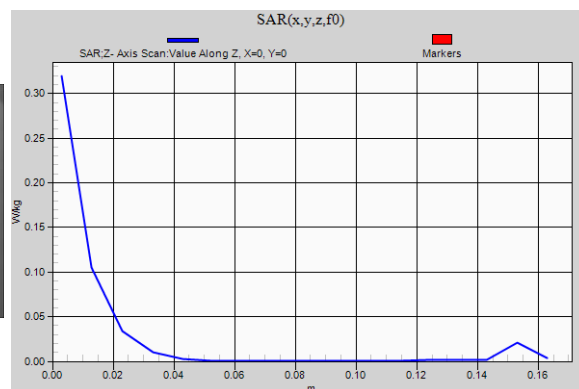
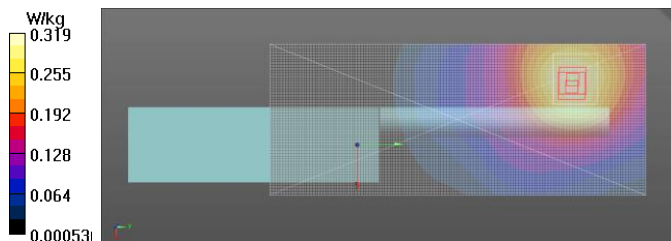
Smallest distance from peaks to all points 3 dB below: Larger than measurement grid

Ratio of SAR at M2 to SAR at M1 = 57.3%

Maximum value of SAR (measured) = 0.325 W/kg

2-3GHz Body/Body Scan/Z- Axis Scan (1x1x17): Measurement grid: dx=20mm, dy=20mm, dz=10mm

Maximum value of SAR (measured) = 0.319 W/kg



Test Laboratory: SGS SAR Laboratory North America

Date/Time: 9/25/2024 2:38:59 PM

Plot #3

DUT: RF 2150 Back Chain 2

DASY5 Configuration:

- Communication System: UID 10012 - CAB, IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps); Frequency: 2462 MHz;
- Probe: ES3DV3 - SN3272; ConvF(4.52, 4.52, 4.52) @ 2462 MHz; Calibrated: 2/26/2024
- Medium parameters used: $f = 2462$ MHz; $\sigma = 1.746$ S/m; $\epsilon_r = 36.432$; $\rho = 1000$ kg/m³; Phantom: ELI v5.0; Phantom section: Flat Section
- Electronics: DAE4 Sn1287; Calibrated: 2/19/2024
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

2-3GHz Body/Body Scan/Area Scan (71x271x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm

Reference Value = 17.67 V/m; Power Drift = -0.05 dB

Fast SAR: SAR(1 g) = 0.487 W/kg; SAR(10 g) = 0.291 W/kg (SAR corrected for target medium)

Maximum value of SAR (interpolated) = 0.588 W/kg

2-3GHz Body/Body Scan/Zoom Scan (8x8x8)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 17.67 V/m; Power Drift = -0.05 dB

Peak SAR (extrapolated) = 0.836 W/kg

SAR(1 g) = 0.495 W/kg; SAR(10 g) = 0.305 W/kg (SAR corrected for target medium)

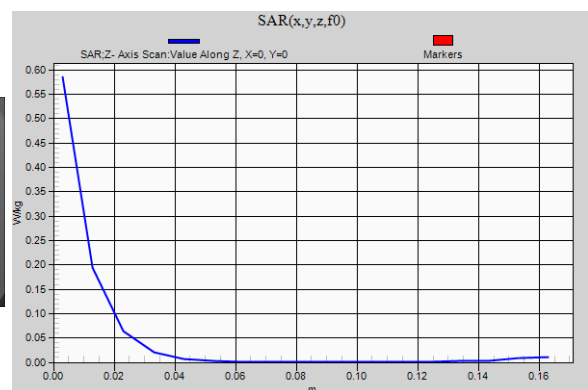
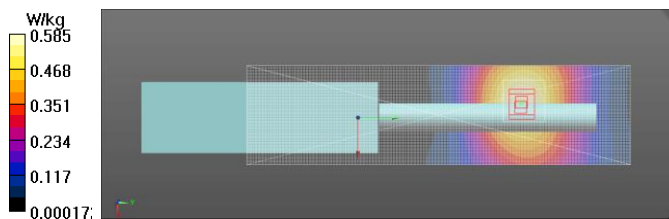
Smallest distance from peaks to all points 3 dB below: Larger than measurement grid

Ratio of SAR at M2 to SAR at M1 = 57.4%

Maximum value of SAR (measured) = 0.593 W/kg

2-3GHz Body/Body Scan/Z- Axis Scan (1x1x17): Measurement grid: dx=20mm, dy=20mm, dz=10mm

Maximum value of SAR (measured) = 0.585 W/kg



Test Laboratory: SGS SAR Laboratory North America

Date/Time: 9/26/2024 2:53:30 PM

Plot #4

DUT: RF 2150 Front Chain 2

DASY5 Configuration:

- Communication System: UID 10012 - CAB, IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps); Frequency: 2467 MHz;
- Probe: ES3DV3 - SN3272; ConvF(4.52, 4.52, 4.52) @ 2467 MHz; Calibrated: 2/26/2024
- Medium parameters used: $f = 2467$ MHz; $\sigma = 1.764$ S/m; $\epsilon_r = 37.21$; $\rho = 1000$ kg/m³; Phantom: ELI v5.0; Phantom section: Flat Section
- Electronics: DAE4 Sn1287; Calibrated: 2/19/2024
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

2-3GHz Body/Body Scan/Area Scan (71x271x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm

Reference Value = 10.79 V/m; Power Drift = -0.12 dB

Fast SAR: SAR(1 g) = 0.169 W/kg; SAR(10 g) = 0.101 W/kg (SAR corrected for target medium)

Maximum value of SAR (interpolated) = 0.203 W/kg

2-3GHz Body/Body Scan/Zoom Scan (8x8x8)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 10.79 V/m; Power Drift = -0.12 dB

Peak SAR (extrapolated) = 0.278 W/kg

SAR(1 g) = 0.166 W/kg; SAR(10 g) = 0.103 W/kg (SAR corrected for target medium)

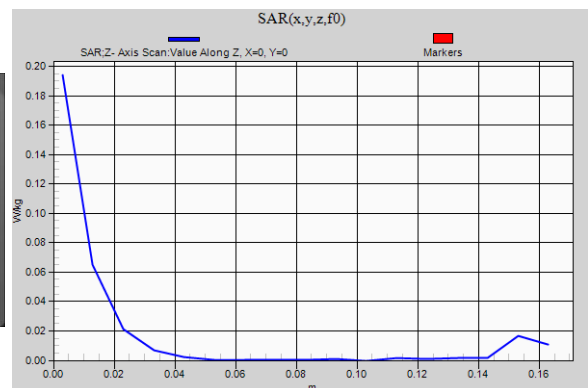
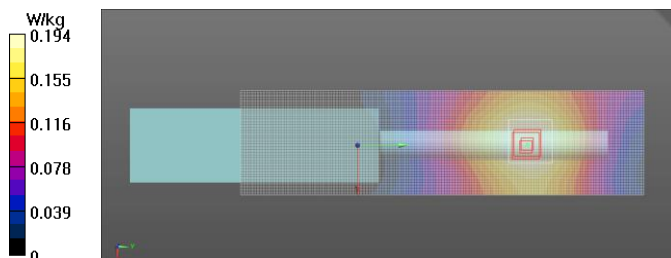
Smallest distance from peaks to all points 3 dB below: Larger than measurement grid

Ratio of SAR at M2 to SAR at M1 = 57.6%

Maximum value of SAR (measured) = 0.198 W/kg

2-3GHz Body/Body Scan/Z- Axis Scan (1x1x17): Measurement grid: dx=20mm, dy=20mm, dz=10mm

Maximum value of SAR (measured) = 0.194 W/kg



Test Laboratory: SGS SAR Laboratory North America

Date/Time: 9/26/2024 12:31:01 PM

Plot #5

DUT: RF 2150 Back Chain 3

DASY5 Configuration:

- Communication System: UID 10012 - CAB, IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps); Frequency: 2467 MHz;
- Probe: ES3DV3 - SN3272; ConvF(4.52, 4.52, 4.52) @ 2467 MHz; Calibrated: 2/26/2024
- Medium parameters used: $f = 2467$ MHz; $\sigma = 1.764$ S/m; $\epsilon_r = 37.21$; $\rho = 1000$ kg/m³; Phantom: ELI v5.0; Phantom section: Flat Section
- Electronics: DAE4 Sn1287; Calibrated: 2/19/2024
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

2-3GHz Body/Body Scan/Area Scan (101x251x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm

Reference Value = 15.39 V/m; Power Drift = 0.01 dB

Fast SAR: SAR(1 g) = 0.389 W/kg; SAR(10 g) = 0.230 W/kg (SAR corrected for target medium)

Maximum value of SAR (interpolated) = 0.470 W/kg

2-3GHz Body/Body Scan/Zoom Scan (8x8x8)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 15.39 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 0.652 W/kg

SAR(1 g) = 0.390 W/kg; SAR(10 g) = 0.237 W/kg (SAR corrected for target medium)

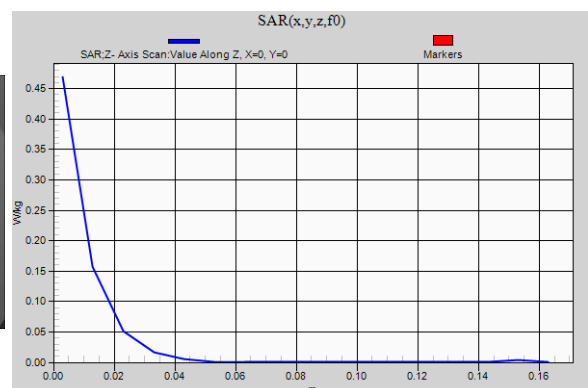
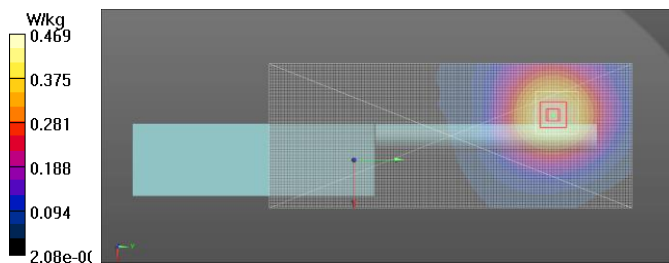
Smallest distance from peaks to all points 3 dB below: Larger than measurement grid

Ratio of SAR at M2 to SAR at M1 = 57.6%

Maximum value of SAR (measured) = 0.465 W/kg

2-3GHz Body/Body Scan/Z- Axis Scan (1x1x17): Measurement grid: dx=20mm, dy=20mm, dz=10mm

Maximum value of SAR (measured) = 0.469 W/kg



Test Laboratory: SGS SAR Laboratory North America

Date/Time: 9/27/2024 10:51:51 AM

Plot #6

DUT: RF 2150 Front Chain 3

DASY5 Configuration:

- Communication System: UID 10012 - CAB, IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps); Frequency: 2467 MHz;
- Probe: ES3DV3 - SN3272; ConvF(4.52, 4.52, 4.52) @ 2467 MHz; Calibrated: 2/26/2024
- Medium parameters used: $f = 2467$ MHz; $\sigma = 1.762$ S/m; $\epsilon_r = 37.221$; $\rho = 1000$ kg/m³; Phantom: ELI v5.0; Phantom section: Flat Section
- Electronics: DAE4 Sn1287; Calibrated: 2/19/2024
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

2-3GHz Body/Body Scan/Area Scan (101x251x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm

Reference Value = 11.66 V/m; Power Drift = -0.13 dB

Fast SAR: SAR(1 g) = 0.240 W/kg; SAR(10 g) = 0.144 W/kg (SAR corrected for target medium)

Maximum value of SAR (interpolated) = 0.289 W/kg

2-3GHz Body/Body Scan/Zoom Scan (8x8x8)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 11.66 V/m; Power Drift = -0.13 dB

Peak SAR (extrapolated) = 0.404 W/kg

SAR(1 g) = 0.243 W/kg; SAR(10 g) = 0.149 W/kg (SAR corrected for target medium)

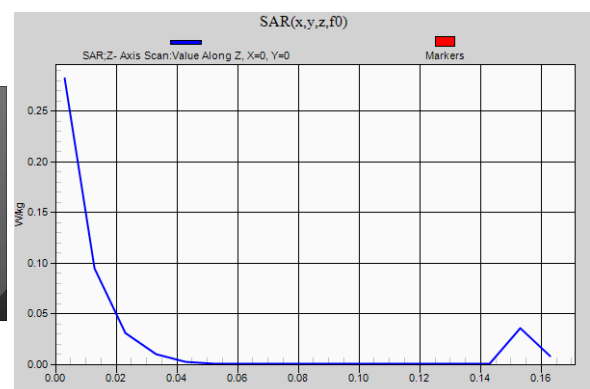
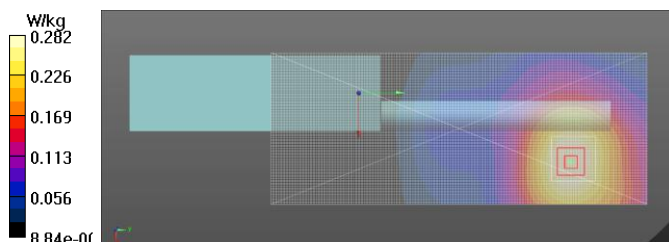
Smallest distance from peaks to all points 3 dB below: Larger than measurement grid

Ratio of SAR at M2 to SAR at M1 = 57.7%

Maximum value of SAR (measured) = 0.289 W/kg

2-3GHz Body/Body Scan/Z- Axis Scan (1x1x17): Measurement grid: dx=20mm, dy=20mm, dz=10mm

Maximum value of SAR (measured) = 0.282 W/kg



APPENDIX C – SYSTEM VERIFICATION

Test Laboratory: SGS SAR Laboratory North America

Date/Time: 9/25/2024 8:25:40 AM

DUT: D2450V2 - SN890

DASY5 Configuration:

- Communication System: UID 0, CW (0); Frequency: 2450 MHz;
- Probe: ES3DV3 - SN3272; ConvF(4.52, 4.52, 4.52) @ 2450 MHz; Calibrated: 2/26/2024
- Medium parameters used: $f = 2450$ MHz; $\sigma = 1.738$ S/m; $\epsilon_r = 36.447$; $\rho = 1000$ kg/m³; Phantom: ELI v5.0; Phantom section: Flat Section
- Electronics: DAE4 Sn1287; Calibrated: 2/19/2024
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

System validation 2-3GHz rev1/System verification/Dipole Area Scan 2 (41x71x1): Interpolated grid:

$dx=1.200$ mm, $dy=1.200$ mm

Reference Value = 57.44 V/m; Power Drift = 0.03 dB

Fast SAR: SAR(1 g) = 4.09 W/kg; SAR(10 g) = 1.87 W/kg (SAR corrected for target medium)

Maximum value of SAR (interpolated) = 5.57 W/kg

System validation 2-3GHz rev1/System verification/0 degree Zoom Scan (7x7x7)/Cube 0:

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

Reference Value = 57.44 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 8.08 W/kg

SAR(1 g) = 4 W/kg; SAR(10 g) = 1.86 W/kg (SAR corrected for target medium)

Smallest distance from peaks to all points 3 dB below = 9.5 mm

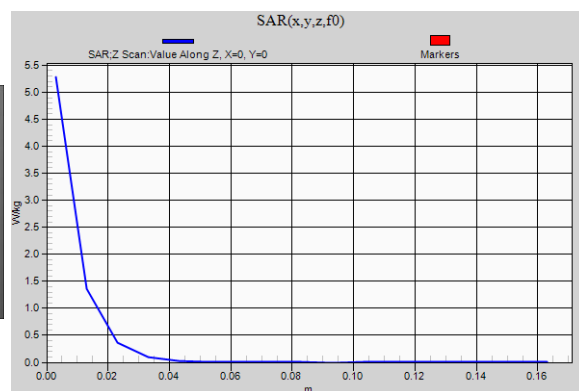
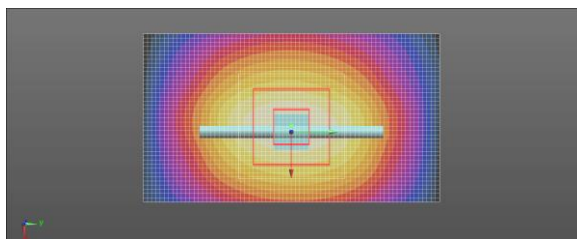
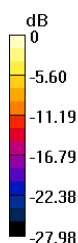
Ratio of SAR at M2 to SAR at M1 = 50.2%

Maximum value of SAR (measured) = 5.29 W/kg

System validation 2-3GHz rev1/System verification/Z Scan (1x1x17): Measurement grid: $dx=20$ mm,

$dy=20$ mm, $dz=10$ mm

Maximum value of SAR (measured) = 5.28 W/kg



Test Laboratory: SGS SAR Laboratory North America

Date/Time: 9/26/2024 8:02:21 AM

DUT: D2450V2 - SN890

DASY5 Configuration:

- Communication System: UID 0, CW (0); Frequency: 2450 MHz;
- Probe: ES3DV3 - SN3272; ConvF(4.52, 4.52, 4.52) @ 2450 MHz; Calibrated: 2/26/2024
- Medium parameters used: $f = 2450$ MHz; $\sigma = 1.753$ S/m; $\epsilon_r = 37.233$; $\rho = 1000$ kg/m³; Phantom: ELI v5.0; Phantom section: Flat Section
- Electronics: DAE4 Sn1287; Calibrated: 2/19/2024
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

System validation 2-3GHz rev1/System verification/Dipole Area Scan 2 (41x71x1): Interpolated grid:

$dx=1.200$ mm, $dy=1.200$ mm

Reference Value = 57.13 V/m; Power Drift = 0.09 dB

Fast SAR: SAR(1 g) = 4.13 W/kg; SAR(10 g) = 1.9 W/kg (SAR corrected for target medium)

Maximum value of SAR (interpolated) = 5.61 W/kg

System validation 2-3GHz rev1/System verification/0 degree Zoom Scan (7x7x7)/Cube 0:

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

Reference Value = 57.13 V/m; Power Drift = 0.09 dB

Peak SAR (extrapolated) = 8.14 W/kg

SAR(1 g) = 4.04 W/kg; SAR(10 g) = 1.89 W/kg (SAR corrected for target medium)

Smallest distance from peaks to all points 3 dB below = 9.8 mm

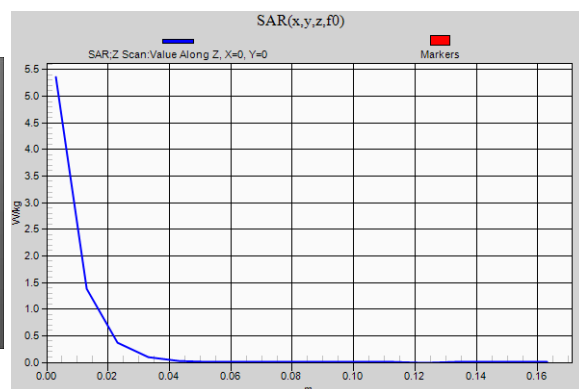
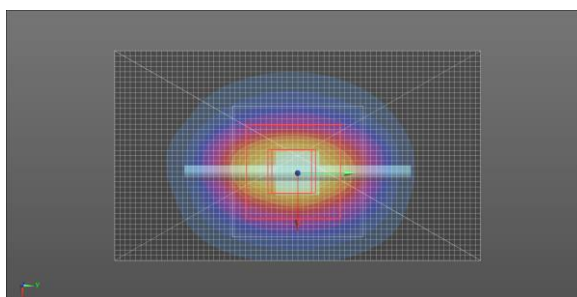
Ratio of SAR at M2 to SAR at M1 = 50.3%

Maximum value of SAR (measured) = 5.32 W/kg

System validation 2-3GHz rev1/System verification/Z Scan (1x1x17): Measurement grid: $dx=20$ mm,

$dy=20$ mm, $dz=10$ mm

Maximum value of SAR (measured) = 5.36 W/kg



Test Laboratory: SGS SAR Laboratory North America

Date/Time: 9/27/2024 10:00:50 AM

DUT: D2450V2 - SN890

DASY5 Configuration:

- Communication System: UID 0, CW (0); Frequency: 2450 MHz;
- Probe: ES3DV3 - SN3272; ConvF(4.52, 4.52, 4.52) @ 2450 MHz; Calibrated: 2/26/2024
- Medium parameters used: $f = 2450$ MHz; $\sigma = 1.749$ S/m; $\epsilon_r = 37.245$; $\rho = 1000$ kg/m³; Phantom: ELI v5.0; Phantom section: Flat Section
- Electronics: DAE4 Sn1287; Calibrated: 2/19/2024
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

System validation 2-3GHz rev1/System verification/Dipole Area Scan 2 (41x71x1): Interpolated grid:

$dx=1.200$ mm, $dy=1.200$ mm

Reference Value = 58.40 V/m; Power Drift = -0.01 dB

Fast SAR: SAR(1 g) = 4.22 W/kg; SAR(10 g) = 1.94 W/kg (SAR corrected for target medium)

Maximum value of SAR (interpolated) = 5.70 W/kg

System validation 2-3GHz rev1/System verification/0 degree Zoom Scan (7x7x7)/Cube 0:

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

Reference Value = 58.40 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 8.31 W/kg

SAR(1 g) = 4.16 W/kg; SAR(10 g) = 1.95 W/kg (SAR corrected for target medium)

Smallest distance from peaks to all points 3 dB below = 9.5 mm

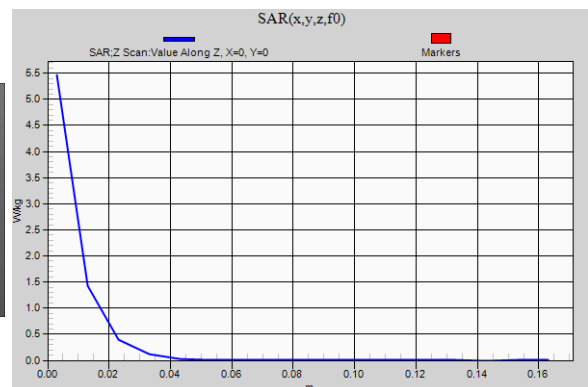
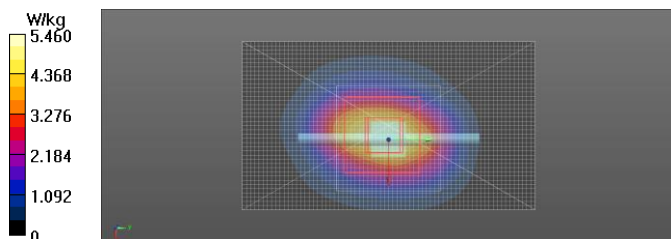
Ratio of SAR at M2 to SAR at M1 = 50.7%

Maximum value of SAR (measured) = 5.45 W/kg

System validation 2-3GHz rev1/System verification/Z Scan (1x1x17): Measurement grid: $dx=20$ mm,

$dy=20$ mm, $dz=10$ mm

Maximum value of SAR (measured) = 5.46 W/kg



REVISION HISTORY

Revision Level	Description of changes	Revision Date
0	Initial release	21 October 2024