APPENDIX A: SAR TEST DATA

DUT: ZNFK300TM; Type: Portable Handset; Serial: 10342

Communication System: UID 0, GSM GPRS; 4 Tx slots; Frequency: 836.6 MHz; Duty Cycle: 1:2.076 Medium: 835 Head; Medium parameters used (interpolated): f = 836.6 MHz; $\sigma = 0.879$ S/m; $\varepsilon_r = 39.74$; $\rho = 1000$ kg/m³ Phantom section: Left Section

Test Date: 03/02/2020; Ambient Temp: 22.7°C; Tissue Temp: 21.3°C

Probe: EX3DV4 - SN7406; ConvF(9.78, 9.78, 9.78) @ 836.6 MHz; Calibrated: 5/16/2019 Sensor-Surface: 1.4mm (Mechanical Surface Detection) Electronics: DAE4 Sn728; Calibrated: 5/8/2019 Phantom: Twin-SAM V5.0 Left 30; Type: QD 000 P40 CD; Serial: 1715 Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7483)

Mode: GPRS 850, Left Head, Cheek, Mid.ch, 4 Tx slots

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm Zoom Scan (6x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm Reference Value = 21.46 V/m; Power Drift = -0.01 dB Peak SAR (extrapolated) = 0.491 W/kg SAR(1 g) = 0.393 W/kg



0 dB = 0.454 W/kg = -3.43 dBW/kg

DUT: ZNFK300TM; Type: Portable Handset; Serial: 10342

Communication System: UID 0, GSM GPRS; 4 Tx slots; Frequency: 1880 MHz; Duty Cycle: 1:2.076 Medium: 1900 Head; Medium parameters used: f = 1880 MHz; $\sigma = 1.413$ S/m; $\varepsilon_r = 40.665$; $\rho = 1000$ kg/m³ Phantom section: Left Section

Test Date: 03/05/2020; Ambient Temp: 22.7°C; Tissue Temp: 22.4°C

Probe: EX3DV4 - SN7409; ConvF(8.01, 8.01, 8.01) @ 1880 MHz; Calibrated: 6/19/2019 Sensor-Surface: 1.4mm (Mechanical Surface Detection) Electronics: DAE4 Sn1334; Calibrated: 6/20/2019 Phantom: Front; Type: QD 000 P40 CD; Serial: 1686 Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7483)

Mode: GPRS 1900, Left Head, Cheek, Mid.ch, 4 Tx slots

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm Reference Value = 11.40 V/m; Power Drift = 0.06 dB Peak SAR (extrapolated) = 0.298 W/kg SAR(1 g) = 0.182 W/kg



DUT: ZNFK300TM; Type: Portable Handset; Serial: 10342

Communication System: UID 0, UMTS; Frequency: 836.6 MHz; Duty Cycle: 1:1 Medium: 835 Head; Medium parameters used (interpolated): f = 836.6 MHz; $\sigma = 0.879$ S/m; $\epsilon_r = 39.74$; $\rho = 1000$ kg/m³ Phantom section: Left Section

Test Date: 03/02/2020; Ambient Temp: 22.7°C; Tissue Temp: 21.3°C

Probe: EX3DV4 - SN7406; ConvF(9.78, 9.78, 9.78) @ 836.6 MHz; Calibrated: 5/16/2019 Sensor-Surface: 1.4mm (Mechanical Surface Detection) Electronics: DAE4 Sn728; Calibrated: 5/8/2019 Phantom: Twin-SAM V5.0 Left 30; Type: QD 000 P40 CD; Serial: 1715 Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7483)

Mode: UMTS 850, Left Head, Cheek, Mid.ch

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm Reference Value = 19.69 V/m; Power Drift = 0.07 dB Peak SAR (extrapolated) = 0.404 W/kg SAR(1 g) = 0.322 W/kg



DUT: ZNFK300TM; Type: Portable Handset; Serial: 10227

 $\begin{array}{l} \mbox{Communication System: UID 0, UMTS; Frequency: 1732.4 MHz; Duty Cycle: 1:1 \\ \mbox{Medium: 1750 Head; Medium parameters used (interpolated):} \\ f = 1732.4 \mbox{ MHz; } \sigma = 1.331 \mbox{ S/m; } \epsilon_r = 38.444; \mbox{$\rho = 1000 kg/m^3$} \\ \mbox{Phantom section: Right Section} \end{array}$

Test Date: 02/26/2020; Ambient Temp: 21.2°C; Tissue Temp: 20.40°C

Probe: EX3DV4 - SN7410; ConvF(8.46, 8.46, 8.46) @ 1732.4 MHz; Calibrated: 7/16/2019 Sensor-Surface: 1.4mm (Mechanical Surface Detection) Electronics: DAE4 Sn1322; Calibrated: 7/11/2019 Phantom: Twin-SAM V8.0; Type: QD 000 P41 Ax; Serial: 1966 Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7483)

Mode: UMTS 1750, Right Head, Cheek, Mid.ch

Area Scan (8x13x1): Measurement grid: dx=15mm, dy=15mm Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm Reference Value = 14.06 V/m; Power Drift = 0.09 dB Peak SAR (extrapolated) = 0.374 W/kg SAR(1 g) = 0.242 W/kg



DUT: ZNFK300TM; Type: Portable Handset; Serial: 10334

Communication System: UID 0, UMTS; Frequency: 1880 MHz; Duty Cycle: 1:1 Medium: 1900 Head; Medium parameters used: f = 1880 MHz; $\sigma = 1.413$ S/m; $\epsilon_r = 40.665$; $\rho = 1000$ kg/m³ Phantom section: Right Section

Test Date: 03/05/2020; Ambient Temp: 22.7°C; Tissue Temp: 22.4°C

Probe: EX3DV4 - SN7409; ConvF(8.01, 8.01, 8.01) @ 1880 MHz; Calibrated: 6/19/2019 Sensor-Surface: 1.4mm (Mechanical Surface Detection) Electronics: DAE4 Sn1334; Calibrated: 6/20/2019 Phantom: Front; Type: QD 000 P40 CD; Serial: 1686 Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7483)

Mode: UMTS 1900, Right Head, Cheek, Mid.ch

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm Reference Value = 17.07 V/m; Power Drift = 0.12 dB Peak SAR (extrapolated) = 0.654 W/kg SAR(1 g) = 0.396 W/kg



DUT: ZNFK300TM; Type: Portable Handset; Serial: 10334

Communication System: UID 0, Cellular CDMA; Frequency: 820.1 MHz; Duty Cycle: 1:1 Medium: 835 Head; Medium parameters used (interpolated): f = 820.1 MHz; $\sigma = 0.863$ S/m; $\varepsilon_r = 39.962$; $\rho = 1000$ kg/m³ Phantom section: Right Section

Test Date: 03/02/2020; Ambient Temp: 22.7°C; Tissue Temp: 21.3°C

Probe: EX3DV4 - SN7406; ConvF(9.78, 9.78, 9.78) @ 820.1 MHz; Calibrated: 5/16/2019 Sensor-Surface: 1.4mm (Mechanical Surface Detection) Electronics: DAE4 Sn728; Calibrated: 5/8/2019 Phantom: Twin-SAM V5.0 Left 30; Type: QD 000 P40 CD; Serial: 1715 Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7483)

Mode: Cell. CDMA, BC 10, Right Head, Cheek, Mid.ch

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm Reference Value = 19.96 V/m; Power Drift = 0.02 dB Peak SAR (extrapolated) = 0.418 W/kg SAR(1 g) = 0.332 W/kg



DUT: ZNFK300TM; Type: Portable Handset; Serial: 10334

Communication System: UID 0, Cellular CDMA; Frequency: 836.52 MHz; Duty Cycle: 1:1 Medium: 835 Head; Medium parameters used (interpolated): f = 836.52 MHz; $\sigma = 0.879$ S/m; $\varepsilon_r = 39.741$; $\rho = 1000$ kg/m³ Phantom section: Left Section

Test Date: 03/02/2020; Ambient Temp: 22.7°C; Tissue Temp: 21.3°C

Probe: EX3DV4 - SN7406; ConvF(9.78, 9.78, 9.78) @ 836.52 MHz; Calibrated: 5/16/2019 Sensor-Surface: 1.4mm (Mechanical Surface Detection) Electronics: DAE4 Sn728; Calibrated: 5/8/2019 Phantom: Twin-SAM V5.0 Left 30; Type: QD 000 P40 CD; Serial: 1715 Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7483)

Mode: Cell. CDMA, BC 0, Left Head, Cheek, Mid.ch

Area Scan (9x14x1): Measurement grid: dx=15mm, dy=15mm Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm Reference Value = 20.89 V/m; Power Drift = -0.18 dB Peak SAR (extrapolated) = 0.449 W/kg SAR(1 g) = 0.355 W/kg



DUT: ZNFK300TM; Type: Portable Handset; Serial: 10334

 $\begin{array}{l} \mbox{Communication System: UID 0, CDMA; Frequency: 1880 MHz; Duty Cycle: 1:1 \\ Medium: 1900 Head; Medium parameters used: \\ f = 1880 MHz; \sigma = 1.413 S/m; \epsilon_r = 40.665; \rho = 1000 \ \mbox{kg/m}^3 \\ \mbox{Phantom section: Right Section} \end{array}$

Test Date: 03/05/2020; Ambient Temp: 22.7°C; Tissue Temp: 22.4°C

Probe: EX3DV4 - SN7409; ConvF(8.01, 8.01, 8.01) @ 1880 MHz; Calibrated: 6/19/2019 Sensor-Surface: 1.4mm (Mechanical Surface Detection) Electronics: DAE4 Sn1334; Calibrated: 6/20/2019 Phantom: Front; Type: QD 000 P40 CD; Serial: 1686 Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7483)

Mode: PCS CDMA, Right Head, Cheek, Mid.ch

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm Reference Value = 16.87 V/m; Power Drift = 0.12 dB Peak SAR (extrapolated) = 0.675 W/kg SAR(1 g) = 0.429 W/kg



0 dB = 0.600 W/kg = -2.22 dBW/kg

DUT: ZNFK300TM; Type: Portable Handset; Serial: 10318

Communication System: UID 0, LTE Band 71; Frequency: 680.5 MHz; Duty Cycle: 1:1 Medium: 750 Head; Medium parameters used (interpolated): f = 680.5 MHz; $\sigma = 0.844$ S/m; $\varepsilon_r = 40.662$; $\rho = 1000$ kg/m³ Phantom section: Left Section

Test Date: 02/26/2020; Ambient Temp: 21.2°C; Tissue Temp: 20.40°C

Probe: EX3DV4 - SN7410; ConvF(9.95, 9.95, 9.95) @ 680.5 MHz; Calibrated: 7/16/2019 Sensor-Surface: 1.4mm (Mechanical Surface Detection) Electronics: DAE4 Sn1322; Calibrated: 7/11/2019 Phantom: Twin-SAM V8.0; Type: QD 000 P41 Ax; Serial: 1966 Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7483)

Mode: LTE Band 71, Left Head, Cheek, Mid.ch, 20 MHz Bandwidth, QPSK, 1 RB, 50 RB Offset

Area Scan (8x13x1): Measurement grid: dx=15mm, dy=15mm Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm Reference Value = 16.90 V/m; Power Drift = 0.03 dB Peak SAR (extrapolated) = 0.256 W/kg SAR(1 g) = 0.214 W/kg



0 dB = 0.244 W/kg = -6.13 dBW/kg

DUT: ZNFK300TM; Type: Portable Handset; Serial: 10318

Communication System: UID 0, LTE Band 12; Frequency: 707.5 MHz; Duty Cycle: 1:1 Medium: 750 Head; Medium parameters used (interpolated): f = 707.5 MHz; $\sigma = 0.853$ S/m; $\varepsilon_r = 40.581$; $\rho = 1000$ kg/m³ Phantom section: Left Section

Test Date: 02/26/2020; Ambient Temp: 21.2°C; Tissue Temp: 20.40°C

Probe: EX3DV4 - SN7410; ConvF(9.95, 9.95, 9.95) @ 707.5 MHz; Calibrated: 7/16/2019 Sensor-Surface: 1.4mm (Mechanical Surface Detection) Electronics: DAE4 Sn1322; Calibrated: 7/11/2019 Phantom: Twin-SAM V8.0; Type: QD 000 P41 Ax; Serial: 1966 Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7483)

Mode: LTE Band 12, Left Head, Cheek, Mid.ch, QPSK, 10 MHz Bandwidth, 1 RB, 25 RB Offset

Area Scan (8x13x1): Measurement grid: dx=15mm, dy=15mm Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm Reference Value = 19.35 V/m; Power Drift = -0.07 dB Peak SAR (extrapolated) = 0.346 W/kg SAR(1 g) = 0.291 W/kg



DUT: ZNFK300TM; Type: Portable Handset; Serial: 10318

 $\begin{array}{l} \mbox{Communication System: UID 0, LTE Band 13; Frequency: 782 MHz; Duty Cycle: 1:1 } \\ \mbox{Medium: 750 Head; Medium parameters used (interpolated):} \\ \mbox{f = 782 MHz; } \sigma = 0.88 \ \mbox{S/m; } \epsilon_r = 40.362; \ \mbox{\rho} = 1000 \ \mbox{kg/m}^3 \\ \mbox{Phantom section: Left Section} \end{array}$

Test Date: 02/26/2020; Ambient Temp: 21.2°C; Tissue Temp: 20.40°C

Probe: EX3DV4 - SN7410; ConvF(9.95, 9.95, 9.95) @ 782 MHz; Calibrated: 7/16/2019 Sensor-Surface: 1.4mm (Mechanical Surface Detection) Electronics: DAE4 Sn1322; Calibrated: 7/11/2019 Phantom: Twin-SAM V8.0; Type: QD 000 P41 Ax; Serial: 1966 Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7483)

Mode: LTE Band 13, Left Head, Cheek, Mid.ch, QPSK, 10 MHz Bandwidth, 1 RB, 25 RB

Area Scan (8x13x1): Measurement grid: dx=15mm, dy=15mm Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm Reference Value = 20.60 V/m; Power Drift = 0.01 dB Peak SAR (extrapolated) = 0.394 W/kg SAR(1 g) = 0.336 W/kg



0 dB = 0.380 W/kg = -4.20 dBW/kg

DUT: ZNFK300TM; Type: Portable Handset; Serial: 10342

Communication System: UID 0, LTE Band 26; Frequency: 831.5 MHz; Duty Cycle: 1:1 Medium: 835 Head; Medium parameters used (interpolated): f = 831.5 MHz; $\sigma = 0.874$ S/m; $\varepsilon_r = 39.807$; $\rho = 1000$ kg/m³ Phantom section: Right Section

Test Date: 03/02/2020; Ambient Temp: 22.7°C; Tissue Temp: 21.3°C

Probe: EX3DV4 - SN7406; ConvF(9.78, 9.78, 9.78) @ 831.5 MHz; Calibrated: 5/16/2019 Sensor-Surface: 1.4mm (Mechanical Surface Detection) Electronics: DAE4 Sn728; Calibrated: 5/8/2019 Phantom: Twin-SAM V5.0 Left 30; Type: QD 000 P40 CD; Serial: 1715 Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7483)

Mode: LTE Band 26 (Cell.), Right Head, Cheek, Mid.ch, 15 MHz Bandwidth, QPSK, 1 RB, 36 RB Offset

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm Reference Value = 21.40 V/m; Power Drift = -0.05 dB Peak SAR (extrapolated) = 0.449 W/kg SAR(1 g) = 0.357 W/kg



0 dB = 0.420 W/kg = -3.77 dBW/kg

DUT: ZNFK300TM; Type: Portable Handset; Serial: 10318

Communication System: UID 0, LTE Band 66 (AWS); Frequency: 1770 MHz; Duty Cycle: 1:1 Medium: 1750 Head; Medium parameters used: f = 1770 MHz; $\sigma = 1.354$ S/m; $\epsilon_r = 38.379$; $\rho = 1000$ kg/m³ Phantom section: Right Section

Test Date: 02/26/2020; Ambient Temp: 21.2°C; Tissue Temp: 20.40°C

Probe: EX3DV4 - SN7410; ConvF(8.46, 8.46, 8.46) @ 1770 MHz; Calibrated: 7/16/2019 Sensor-Surface: 1.4mm (Mechanical Surface Detection) Electronics: DAE4 Sn1322; Calibrated: 7/11/2019 Phantom: Twin-SAM V8.0; Type: QD 000 P41 Ax; Serial: 1966 Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7483)

Mode: LTE Band 66 (AWS), Right Head, Cheek, High.ch, 20 MHz Bandwidth, QPSK, 1 RB, 50 RB Offset

Area Scan (8x13x1): Measurement grid: dx=15mm, dy=15mm Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm Reference Value = 15.48 V/m; Power Drift = -0.06 dB Peak SAR (extrapolated) = 0.422 W/kg SAR(1 g) = 0.269 W/kg



0 dB = 0.366 W/kg = -4.37 dBW/kg

DUT: ZNFK300TM; Type: Portable Handset; Serial: 10334

 $\begin{array}{l} \mbox{Communication System: UID 0, LTE Band 25 (PCS); Frequency: 1860 MHz; Duty Cycle: 1:1 \\ \mbox{Medium: 1900 Head; Medium parameters used:} \\ f = 1860 \mbox{ MHz; } \sigma = 1.391 \mbox{ S/m; } \epsilon_r = 40.742; \mbox{ } \rho = 1000 \mbox{ kg/m}^3 \\ \mbox{Phantom section: Left Section} \end{array}$

Test Date: 03/05/2020; Ambient Temp: 22.7°C; Tissue Temp: 22.4°C

Probe: EX3DV4 - SN7409; ConvF(8.01, 8.01, 8.01) @ 1860 MHz; Calibrated: 6/19/2019 Sensor-Surface: 1.4mm (Mechanical Surface Detection) Electronics: DAE4 Sn1334; Calibrated: 6/20/2019 Phantom: Front; Type: QD 000 P40 CD; Serial: 1686 Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7483)

Mode: LTE Band 25 (PCS), Left Head, Cheek, Low.ch 20 MHz Bandwidth, QPSK, 1 RB, 50 RB Offset

Area Scan (9x14x1): Measurement grid: dx=15mm, dy=15mm Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm Reference Value = 18.11 V/m; Power Drift = 0.03 dB Peak SAR (extrapolated) = 0.661 W/kg SAR(1 g) = 0.410 W/kg



DUT: ZNFK300TM; Type: Portable Handset; Serial: 10342

Communication System: UID 0, _LTE Band 41 (Class 2); Frequency: 2680 MHz; Duty Cycle: 1:2.31 Medium: 2450 Head Medium parameters used: f = 2680 MHz; $\sigma = 2.045$ S/m; $\epsilon_r = 37.606$; $\rho = 1000$ kg/m³ Phantom section: Right Section

Test Date: 03/12/2020; Ambient Temp: 22.9°C; Tissue Temp: 21.2°C

Probe: EX3DV4 - SN3589; ConvF(6.6, 6.6, 6.6) @ 2680 MHz; Calibrated: 1/21/2020 Sensor-Surface: 1.4mm (Mechanical Surface Detection) Electronics: DAE4 Sn1558; Calibrated: 1/13/2020 Phantom: Twin-SAM V5.0 (30); Type: QD 000 P40 CD; Serial: 1647 Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7483)

Mode: LTE Band 41 PC2 With ULCA, Right Head, Cheek, High.ch, PCC:20 MHz Bandwidth, QPSK, Ch 41490, 1RB, 0 RB Offset SCC:20 MHz Bandwidth, QPSK, Ch 41292, 1RB, 99 RB Offset

Area Scan (11x17x1): Measurement grid: dx=12mm, dy=12mm Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 9.293 V/m; Power Drift = 0.12 dB Peak SAR (extrapolated) = 0.240 W/kg SAR(1 g) = 0.126 W/kg



DUT: ZNFK300TM; Type: Portable Handset; Serial: 10227

Communication System: UID 0, 802.11b; Frequency: 2437 MHz; Duty Cycle: 1:1 Medium: 2450 Head; Medium parameters used (interpolated): f = 2437 MHz; $\sigma = 1.836$ S/m; $\epsilon_r = 38.434$; $\rho = 1000$ kg/m³ Phantom section: Right Section

Test Date: 03/05/2020; Ambient Temp: 23.2°C; Tissue Temp: 23.0°C

Probe: EX3DV4 - SN3589; ConvF(6.85, 6.85, 6.85) @ 2437 MHz; Calibrated: 1/21/2020 Sensor-Surface: 1.4mm (Mechanical Surface Detection) Electronics: DAE4 Sn1558; Calibrated: 1/13/2020 Phantom: Twin-SAM V5.0 (30); Type: QD 000 P40 CD; Serial: 1647 Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7483)

Mode: IEEE 802.11b, 22 MHz Bandwidth, Right Head, Cheek, Ch 6, 1 Mbps

Area Scan (11x18x1): Measurement grid: dx=12mm, dy=12mmZoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mmReference Value = 5.241 V/m; Power Drift = 0.13 dB Peak SAR (extrapolated) = 0.810 W/kg SAR(1 g) = 0.374 W/kg



DUT: ZNFK300TM; Type: Portable Handset; Serial: 10219

 $\begin{array}{l} \mbox{Communication System: UID 0, 802.11a 5.2-5.8 GHz Band; Frequency: 5825 MHz; Duty Cycle: 1:1 \\ \mbox{Medium: 5200-5800 Head; Medium parameters used:} \\ f = 5825 \mbox{MHz; } \sigma = 5.223 \mbox{ S/m; } \epsilon_r = 34.421; \mbox{$\rho = 1000 kg/m^3$} \\ \mbox{Phantom section: Right Section} \end{array}$

Test Date: 03/09/2020; Ambient Temp: 22.1°C; Tissue Temp: 21.1°C

Probe: EX3DV4 - SN7406; ConvF(5.23, 5.23, 5.23) @ 5825 MHz; Calibrated: 5/16/2019 Sensor-Surface: 1.4mm (Mechanical Surface Detection) Electronics: DAE4 Sn728; Calibrated: 5/8/2019 Phantom: Twin-SAM V5.0 Left 20; Type: QD 000 P40 CD; Serial: 1715 Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7483)

Mode: IEEE 802.11a, U-NII-3, 20 MHz Bandwidth, Right Head, Cheek, Ch 165, 6 Mbps

Area Scan (13x11x1): Measurement grid: dx=10mm, dy=10mm Zoom Scan (7x7x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4 Reference Value = 6.710 V/m; Power Drift = 0.21 dB Peak SAR (extrapolated) = 2.65 W/kg SAR(1 g) = 0.610 W/kg



DUT: ZNFK300TM; Type: Portable Handset; Serial: 10219

Communication System: UID 0, Bluetooth; Frequency: 2441 MHz; Duty Cycle: 1:1.307 Medium: 2450 Head Medium parameters used (interpolated): f = 2441 MHz; $\sigma = 1.839$ S/m; $\epsilon_r = 38.428$; $\rho = 1000$ kg/m³ Phantom section: Right Section

Test Date: 03/05/2020; Ambient Temp: 23.2°C; Tissue Temp: 23.0°C

Probe: EX3DV4 - SN3589; ConvF(6.85, 6.85, 6.85) @ 2441 MHz; Calibrated: 1/21/2020 Sensor-Surface: 1.4mm (Mechanical Surface Detection) Electronics: DAE4 Sn1558; Calibrated: 1/13/2020 Phantom: Twin-SAM V5.0 (30); Type: QD 000 P40 CD; Serial: 1647 Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7483)

Mode: Bluetooth, Right Head, Cheek, Ch 39, 1Mbps

Area Scan (11x17x1): Measurement grid: dx=12mm, dy=12mm Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 4.075 V/m; Power Drift = -0.11 dB Peak SAR (extrapolated) = 0.0710 W/kg SAR(1 g) = 0.029 W/kg



DUT: ZNFK300TM; Type: Portable Handset; Serial: 10342

Communication System: UID 0, GSM GPRS; 4 Tx slots; Frequency: 836.6 MHz; Duty Cycle: 1:2.076 Medium: 835 Body; Medium parameters used (interpolated): f = 836.6 MHz; $\sigma = 0.963$ S/m; $\varepsilon_r = 54.176$; $\rho = 1000$ kg/m³ Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03/04/2020; Ambient Temp: 21.9°C; Tissue Temp: 21.3°C

Probe: EX3DV4 - SN7488; ConvF(11.04, 11.04, 11.04) @ 836.6 MHz; Calibrated: 1/21/2020 Sensor-Surface: 1.4mm (Mechanical Surface Detection) Electronics: DAE4 Sn1530; Calibrated: 1/13/2020 Phantom: Twin-SAM V4.0 Left 30; Type: QD 000 P40 CC; Serial: 1687 Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7483)

Mode: GPRS 850, Body SAR, Back side, Mid.ch, 4 Tx Slots

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm Reference Value = 24.66 V/m; Power Drift = 0.13 dB Peak SAR (extrapolated) = 1.03 W/kg SAR(1 g) = 0.564 W/kg



0 dB = 0.793 W/kg = -1.01 dBW/kg

DUT: ZNFK300TM; Type: Portable Handset; Serial: 10342

Communication System: UID 0, GSM GPRS; 4 Tx slots; Frequency: 1880 MHz; Duty Cycle: 1:2.076 Medium: 1900 Body; Medium parameters used: f = 1880 MHz; $\sigma = 1.543$ S/m; $\varepsilon_r = 52.09$; $\rho = 1000$ kg/m³ Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03/16/2020; Ambient Temp: 24.5°C; Tissue Temp: 22.0°C

Probe: EX3DV4 - SN7551; ConvF(7.69, 7.69, 7.69) @ 1880 MHz; Calibrated: 9/19/2019 Sensor-Surface: 1.4mm (Mechanical Surface Detection) Electronics: DAE4 Sn1333; Calibrated: 9/17/2019 Phantom: Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1792 Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7483)

Mode: GPRS 1900, Body SAR, Back side, Mid.ch, 4 Tx Slots

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm Zoom Scan (6x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm Reference Value = 13.65 V/m; Power Drift = 0.00 dB Peak SAR (extrapolated) = 0.458 W/kg SAR(1 g) = 0.273 W/kg



DUT: ZNFK300TM; Type: Portable Handset; Serial: 10342

Communication System: UID 0, GSM GPRS; 4 Tx slots; Frequency: 1880 MHz; Duty Cycle: 1:2.076 Medium: 1900 Body; Medium parameters used: f = 1880 MHz; $\sigma = 1.543$ S/m; $\varepsilon_r = 52.09$; $\rho = 1000$ kg/m³ Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03/16/2020; Ambient Temp: 24.5°C; Tissue Temp: 22.0°C

Probe: EX3DV4 - SN7551; ConvF(7.69, 7.69, 7.69) @ 1880 MHz; Calibrated: 9/19/2019 Sensor-Surface: 1.4mm (Mechanical Surface Detection) Electronics: DAE4 Sn1333; Calibrated: 9/17/2019 Phantom: Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1792 Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7483)

Mode: GPRS 1900, Body SAR, Front side, Mid.ch, 4 Tx Slots

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm Zoom Scan (6x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm Reference Value = 16.27 V/m; Power Drift = 0.19 dB Peak SAR (extrapolated) = 0.665 W/kg SAR(1 g) = 0.378 W/kg



DUT: ZNFK300TM; Type: Portable Handset; Serial: 10318

Communication System: UID 0, UMTS; Frequency: 836.6 MHz; Duty Cycle: 1:1 Medium: 835 Body; Medium parameters used (interpolated): $f = 836.6 \text{ MHz}; \sigma = 0.963 \text{ S/m}; \epsilon_r = 54.176; \rho = 1000 \text{ kg/m}^3$ Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03/04/2020; Ambient Temp: 21.9°C; Tissue Temp: 21.3°C

Probe: EX3DV4 - SN7488; ConvF(11.04, 11.04, 11.04) @ 836.6 MHz; Calibrated: 1/21/2020 Sensor-Surface: 1.4mm (Mechanical Surface Detection) Electronics: DAE4 Sn1530; Calibrated: 1/13/2020 Phantom: Twin-SAM V4.0 Left 30; Type: QD 000 P40 CC; Serial: 1687 Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7483)

Mode: UMTS 850, Body SAR, Back side, Mid.ch

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm Zoom Scan (6x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm Reference Value = 21.24 V/m; Power Drift = 0.10 dB Peak SAR (extrapolated) = 0.757 W/kg SAR(1 g) = 0.413 W/kg



DUT: ZNFK300TM; Type: Portable Handset; Serial: 10334

 $\begin{array}{l} \mbox{Communication System: UID 0, UMTS; Frequency: 1732.4 MHz; Duty Cycle: 1:1 \\ \mbox{Medium: 1750 Body; Medium parameters used (interpolated):} \\ f = 1732.4 \mbox{ MHz; } \sigma = 1.454 \mbox{ S/m; } \epsilon_r = 55.674; \mbox{$\rho = 1000 \mbox{ kg/m}^3$} \\ \mbox{Phantom section: Flat Section; Space: 1.0 cm} \end{array}$

Test Date: 02/26/2020; Ambient Temp: 21.2°C; Tissue Temp: 20.9°C

Probe: EX3DV4 - SN7357; ConvF(8.26, 8.26, 8.26) @ 1732.4 MHz; Calibrated: 4/24/2019 Sensor-Surface: 1.4mm (Mechanical Surface Detection) Electronics: DAE4 Sn1407; Calibrated: 4/18/2019 Phantom: Right Back Twin-SAM V5.0 (30); Type: QD 000 P40 CD; Serial: 1692 Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7483)

Mode: UMTS 1750, Body SAR, Back side, Mid.ch

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm Reference Value = 22.31 V/m; Power Drift = 0.11 dB Peak SAR (extrapolated) = 1.05 W/kg SAR(1 g) = 0.699 W/kg



DUT: ZNFK300TM; Type: Portable Handset; Serial: 10334

 $\begin{array}{l} \mbox{Communication System: UID 0, UMTS; Frequency: 1907.6 MHz; Duty Cycle: 1:1 } \\ \mbox{Medium: 1900 Body; Medium parameters used (interpolated):} \\ \mbox{f = 1907.6 MHz; } \sigma = 1.571 \ \mbox{S/m; } \epsilon_r = 51.443; \ \mbox{\rho} = 1000 \ \mbox{kg/m}^3 \\ \\ \mbox{Phantom section: Flat Section; Space: 1.0 cm} \end{array}$

Test Date: 03/12/2020; Ambient Temp: 22.0°C; Tissue Temp: 23.5°C

Probe: EX3DV4 - SN7571; ConvF(7.56, 7.56, 7.56) @ 1907.6 MHz; Calibrated: 12/11/2019 Sensor-Surface: 1.4mm (Mechanical Surface Detection) Electronics: DAE4 Sn1533; Calibrated: 12/5/2019 Phantom: SAM Left; Type: QD000P40CC; Serial: TP: 1375 Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7483)

Mode: UMTS 1900, Body SAR, Back side, High.ch

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm Zoom Scan (6x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm Reference Value = 20.78 V/m; Power Drift = -0.03 dB Peak SAR (extrapolated) = 1.07 W/kg SAR(1 g) = 0.623 W/kg



DUT: ZNFK300TM; Type: Portable Handset; Serial: 10334

Communication System: UID 0, UMTS; Frequency: 1852.4 MHz; Duty Cycle: 1:1 Medium: 1900 Body; Medium parameters used (interpolated): f = 1852.4 MHz; $\sigma = 1.51$ S/m; $\epsilon_r = 51.616$; $\rho = 1000$ kg/m³ Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03/12/2020; Ambient Temp: 22.0°C; Tissue Temp: 23.5°C

Probe: EX3DV4 - SN7571; ConvF(7.56, 7.56, 7.56) @ 1852.4 MHz; Calibrated: 12/11/2019 Sensor-Surface: 1.4mm (Mechanical Surface Detection) Electronics: DAE4 Sn1533; Calibrated: 12/5/2019 Phantom: SAM Left; Type: QD000P40CC; Serial: TP: 1375 Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7483)

Mode: UMTS 1900, Body SAR, Front side, High.ch

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm Zoom Scan (9x8x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm Reference Value = 23.81 V/m; Power Drift = 0.06 dB Peak SAR (extrapolated) = 1.33 W/kg SAR(1 g) = 0.760 W/kg



DUT: ZNFK300TM; Type: Portable Handset; Serial: 10318

Communication System: UID 0, CDMA; Frequency: 820.1 MHz; Duty Cycle: 1:1 Medium: 835 Body; Medium parameters used (interpolated): $f = 820.1 \text{ MHz}; \sigma = 0.941 \text{ S/m}; \epsilon_r = 55.059; \rho = 1000 \text{ kg/m}^3$ Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03/16/2020; Ambient Temp: 22.7°C; Tissue Temp: 22.0°C

Probe: EX3DV4 - SN7406; ConvF(9.78, 9.78, 9.78) @ 820.1 MHz; Calibrated: 5/16/2019 Sensor-Surface: 1.4mm (Mechanical Surface Detection) Electronics: DAE4 Sn728; Calibrated: 5/8/2019 Phantom: Twin-SAM V5.0 Left 30; Type: QD 000 P40 CD; Serial: 1715 Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7483)

Mode: Cell. CDMA BC10, Body SAR, Back side, Mid.ch

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm Zoom Scan (6x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm Reference Value = 20.66 V/m; Power Drift = -0.03 dB Peak SAR (extrapolated) = 0.761 W/kg SAR(1 g) = 0.392 W/kg



0 dB = 0.600 W/kg = -2.22 dBW/kg

DUT: ZNFK300TM; Type: Portable Handset; Serial: 10318

Communication System: UID 0, CDMA; Frequency: 820.1 MHz; Duty Cycle: 1:1 Medium: 835 Body Medium parameters used (interpolated): $f = 820.1 \text{ MHz}; \sigma = 0.941 \text{ S/m}; \epsilon_r = 55.059; \rho = 1000 \text{ kg/m}^3$ Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03/16/2020; Ambient Temp: 22.7°C; Tissue Temp: 22.0°C

Probe: EX3DV4 - SN7406; ConvF(9.78, 9.78, 9.78) @ 820.1 MHz; Calibrated: 5/16/2019 Sensor-Surface: 1.4mm (Mechanical Surface Detection) Electronics: DAE4 Sn728; Calibrated: 5/8/2019 Phantom: Twin-SAM V5.0 Left 30; Type: QD 000 P40 CD; Serial: 1715 Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7483)

Mode: Cell. EVDO Rev.0 BC10, Body SAR, Back side, Mid.ch

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm Zoom Scan (6x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm Reference Value = 19.67 V/m; Power Drift = 0.01 dB Peak SAR (extrapolated) = 0.650 W/kg SAR(1 g) = 0.351 W/kg



DUT: ZNFK300TM; Type: Portable Handset; Serial: 10318

 $\begin{array}{l} \mbox{Communication System: UID 0, CDMA; Frequency: 836.52 MHz; Duty Cycle: 1:1 \\ \mbox{Medium: 835 Body; Medium parameters used (interpolated):} \\ f = 836.52 \mbox{ MHz; } \sigma = 0.958 \mbox{ S/m; } \epsilon_r = 54.901; \mbox{$\rho = 1000 \mbox{ kg/m}^3$} \\ \mbox{Phantom section: Flat Section; Space: 1.0 cm} \end{array}$

Test Date: 03/16/2020; Ambient Temp: 22.7°C; Tissue Temp: 22.0°C

Probe: EX3DV4 - SN7406; ConvF(9.78, 9.78, 9.78) @ 836.52 MHz; Calibrated: 5/16/2019 Sensor-Surface: 1.4mm (Mechanical Surface Detection) Electronics: DAE4 Sn728; Calibrated: 5/8/2019 Phantom: Twin-SAM V5.0 Left 30; Type: QD 000 P40 CD; Serial: 1715 Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7483)

Mode: Cell. CDMA, BC 0, Body SAR, Back side, Mid.ch

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm Zoom Scan (6x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm Reference Value = 18.27 V/m; Power Drift = -0.13 dB Peak SAR (extrapolated) = 0.953 W/kg SAR(1 g) = 0.514 W/kg



DUT: ZNFK300TM; Type: Portable Handset; Serial: 10318

 $\begin{array}{l} \mbox{Communication System: UID 0, CDMA; Frequency: 836.52 MHz; Duty Cycle: 1:1 \\ \mbox{Medium: 835 Body Medium parameters used (interpolated):} \\ f = 836.52 \mbox{ MHz; } \sigma = 0.958 \mbox{ S/m; } \epsilon_r = 54.901; \mbox{$\rho = 1000 \mbox{ kg/m}^3$} \\ \mbox{Phantom section: Flat Section; Space: 1.0 cm} \end{array}$

Test Date: 03/16/2020; Ambient Temp: 22.7°C; Tissue Temp: 22.0°C

Probe: EX3DV4 - SN7406; ConvF(9.78, 9.78, 9.78) @ 836.52 MHz; Calibrated: 5/16/2019 Sensor-Surface: 1.4mm (Mechanical Surface Detection) Electronics: DAE4 Sn728; Calibrated: 5/8/2019 Phantom: Twin-SAM V5.0 Left 30; Type: QD 000 P40 CD; Serial: 1715 Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7483)

Mode: Cell. EVDO Rev.0, BC 0, Body SAR, Back side, Mid.ch

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm Zoom Scan (6x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm Reference Value = 19.65 V/m; Power Drift = 0.05 dB Peak SAR (extrapolated) = 0.642 W/kg SAR(1 g) = 0.353 W/kg



DUT: ZNFK300TM; Type: Portable Handset; Serial: 10334

Communication System: UID 0, CDMA; Frequency: 1880 MHz; Duty Cycle: 1:1 Medium: 1900 Body; Medium parameters used: f = 1880 MHz; $\sigma = 1.543$ S/m; $\varepsilon_r = 52.09$; $\rho = 1000$ kg/m³ Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03/16/2020; Ambient Temp: 24.5°C; Tissue Temp: 22.0°C

Probe: EX3DV4 - SN7551; ConvF(7.69, 7.69, 7.69) @ 1880 MHz; Calibrated: 9/19/2019 Sensor-Surface: 1.4mm (Mechanical Surface Detection) Electronics: DAE4 Sn1333; Calibrated: 9/17/2019 Phantom: Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1792 Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7483)

Mode: PCS CDMA, Body SAR, Back side, Mid.ch

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm Reference Value = 18.61 V/m; Power Drift = -0.02 dB Peak SAR (extrapolated) = 0.855 W/kg SAR(1 g) = 0.516 W/kg



DUT: ZNFK300TM; Type: Portable Handset; Serial: 10334

Communication System: UID 0, CDMA; Frequency: 1880 MHz; Duty Cycle: 1:1 Medium: 1900 Body; Medium parameters used: f = 1880 MHz; $\sigma = 1.543$ S/m; $\varepsilon_r = 52.09$; $\rho = 1000$ kg/m³ Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03/16/2020; Ambient Temp: 24.5°C; Tissue Temp: 22.0°C

Probe: EX3DV4 - SN7551; ConvF(7.69, 7.69, 7.69) @ 1880 MHz; Calibrated: 9/19/2019 Sensor-Surface: 1.4mm (Mechanical Surface Detection) Electronics: DAE4 Sn1333; Calibrated: 9/17/2019 Phantom: Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1792 Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7483)

Mode: PCS EVDO Rev.0, Body SAR, Front side, Mid.ch

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm Reference Value = 21.45 V/m; Power Drift = -0.21 dB Peak SAR (extrapolated) = 1.08 W/kg SAR(1 g) = 0.599 W/kg



DUT: ZNFK300TM; Type: Portable Handset; Serial: 10334

Communication System: UID 0, LTE Band 71; Frequency: 680.5 MHz; Duty Cycle: 1:1 Medium: 700 Body; Medium parameters used (interpolated): $f = 680.5 \text{ MHz}; \sigma = 0.919 \text{ S/m}; \epsilon_r = 54.094; \rho = 1000 \text{ kg/m}^3$ Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03/09/2020; Ambient Temp: 23.0°C; Tissue Temp: 21.5°C

Probe: EX3DV4 - SN7547; ConvF(9.81, 9.81, 9.81) @ 680.5 MHz; Calibrated: 7/15/2019 Sensor-Surface: 1.4mm (Mechanical Surface Detection) Electronics: DAE4 Sn1323; Calibrated: 7/11/2019 Phantom: LeftTwin-SAM V5.0; Type: QD 000 P40 CD; Serial: TP1375 Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7483)

Mode: LTE Band 71, Body SAR, Back side, Mid.ch, 20 MHz Bandwidth, QPSK, 1 RB, 50 RB Offset

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm Zoom Scan (6x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm Reference Value = 21.25 V/m; Power Drift = -0.04 dB Peak SAR (extrapolated) = 0.651 W/kg SAR(1 g) = 0.395 W/kg



0 dB = 0.500 W/kg = -3.01 dBW/kg

DUT: ZNFK300TM; Type: Portable Handset; Serial: 10334

Communication System: UID 0, LTE Band 12; Frequency: 707.5 MHz; Duty Cycle: 1:1 Medium: 700 Body; Medium parameters used (interpolated): f = 707.5 MHz; $\sigma = 0.928$ S/m; $\epsilon_r = 53.99$; $\rho = 1000$ kg/m³ Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03/09/2020; Ambient Temp: 23.0°C; Tissue Temp: 21.5°C

Probe: EX3DV4 - SN7547; ConvF(9.81, 9.81, 9.81) @ 707.5 MHz; Calibrated: 7/15/2019 Sensor-Surface: 1.4mm (Mechanical Surface Detection) Electronics: DAE4 Sn1323; Calibrated: 7/11/2019 Phantom: LeftTwin-SAM V5.0; Type: QD 000 P40 CD; Serial: TP1375 Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7483)

Mode: LTE Band 12, Body SAR, Back side, Mid.ch, 10 MHz Bandwidth, QPSK, 1 RB, 25 RB Offset

Area Scan (9x13x1): Measurement grid: dx=15mm, dy=15mm Zoom Scan (7x8x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm Reference Value = 21.30 V/m; Power Drift = 0.08 dB Peak SAR (extrapolated) = 0.656 W/kg SAR(1 g) = 0.418 W/kg



0 dB = 0.600 W/kg = -2.22 dBW/kg

DUT: ZNFK300TM; Type: Portable Handset; Serial: 10334

Communication System: UID 0, LTE Band 13; Frequency: 782 MHz; Duty Cycle: 1:1 Medium: 700 Body; Medium parameters used (interpolated): f = 782 MHz; $\sigma = 0.944$ S/m; $\epsilon_r = 53.208$; $\rho = 1000$ kg/m³ Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03/09/2020; Ambient Temp: 23.0°C; Tissue Temp: 21.5°C

Probe: EX3DV4 - SN7547; ConvF(9.81, 9.81, 9.81) @ 782 MHz; Calibrated: 7/15/2019 Sensor-Surface: 1.4mm (Mechanical Surface Detection) Electronics: DAE4 Sn1323; Calibrated: 7/11/2019 Phantom: LeftTwin-SAM V5.0; Type: QD 000 P40 CD; Serial: TP1375 Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7483)

Mode: LTE Band 13, Body SAR, Back side, Mid.ch 10 MHz Bandwidth, QPSK, 1 RB, 25 RB Offset

Area Scan (9x13x1): Measurement grid: dx=15mm, dy=15mm Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm Reference Value = 25.20 V/m; Power Drift = -0.05 dB Peak SAR (extrapolated) = 1.04 W/kg SAR(1 g) = 0.572 W/kg



DUT: ZNFK300TM; Type: Portable Handset; Serial: 10326

 $\begin{array}{l} \mbox{Communication System: UID 0, LTE Band 26; Frequency: 831.5 MHz; Duty Cycle: 1:1 } \\ \mbox{Medium: 835 Body; Medium parameters used (interpolated):} \\ \mbox{f} = 831.5 \mbox{ MHz; } \sigma = 0.958 \mbox{ S/m; } \epsilon_r = 54.227; \mbox{ρ} = 1000 \mbox{ kg/m}^3 \\ \mbox{Phantom section: Flat Section; Space: 1.0 cm} \end{array}$

Test Date: 03/04/2020; Ambient Temp: 21.9°C; Tissue Temp: 21.3°C

Probe: EX3DV4 - SN7488; ConvF(11.04, 11.04, 11.04) @ 831.5 MHz; Calibrated: 1/21/2020 Sensor-Surface: 1.4mm (Mechanical Surface Detection) Electronics: DAE4 Sn1530; Calibrated: 1/13/2020 Phantom: Twin-SAM V4.0 Left 30; Type: QD 000 P40 CC; Serial: 1687 Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7483)

Mode: LTE Band 26 (Cell.), Body SAR, Back side, Mid.ch 15 MHz Bandwidth, QPSK, 1 RB, 36 RB Offset

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm Zoom Scan (6x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm Reference Value = 21.21 V/m; Power Drift = 0.00 dB Peak SAR (extrapolated) = 0.733 W/kg SAR(1 g) = 0.405 W/kg


DUT: ZNFK300TM; Type: Portable Handset; Serial: 10334

 $\begin{array}{l} \mbox{Communication System: UID 0, LTE Band 66 (AWS); Frequency: 1720 MHz; Duty Cycle: 1:1 \\ Medium: 1750 Body; Medium parameters used: \\ f = 1720 MHz; \mbox{σ} = 1.434 \mbox{ S/m}; \mbox{ϵ}_r = 55.818; \mbox{ρ} = 1000 \mbox{ kg/m}^3 \\ \mbox{Phantom section: Flat Section; Space: 1.0 cm} \end{array}$

Test Date: 03/02/2020; Ambient Temp: 22.8°C; Tissue Temp: 22.0°C

Probe: EX3DV4 - SN7357; ConvF(8.26, 8.26, 8.26) @ 1720 MHz; Calibrated: 4/24/2019 Sensor-Surface: 1.4mm (Mechanical Surface Detection) Electronics: DAE4 Sn1407; Calibrated: 4/18/2019 Phantom: Right Back Twin-SAM V5.0 (30); Type: QD 000 P40 CD; Serial: 1692 Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7483)

Mode: LTE Band 66 (AWS), Body SAR, Back side, Low.ch, 20 MHz Bandwidth, QPSK, 1 RB, 50 RB Offset

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm Zoom Scan (6x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm Reference Value = 23.28 V/m; Power Drift = -0.12 dB Peak SAR (extrapolated) = 1.10 W/kg SAR(1 g) = 0.725 W/kg



DUT: ZNFK300TM; Type: Portable Handset; Serial: 10334

 $\begin{array}{l} \mbox{Communication System: UID 0, LTE Band 25 (PCS); Frequency: 1860 MHz; Duty Cycle: 1:1 \\ \mbox{Medium: 1900 Body; Medium parameters used:} \\ f = 1860 \mbox{ MHz; } \sigma = 1.521 \mbox{ S/m; } \epsilon_r = 52.157; \mbox{$\rho = 1000 \mbox{ kg/m}^3$} \\ \mbox{Phantom section: Flat Section; Space: 1.0 cm} \end{array}$

Test Date: 03/16/2020; Ambient Temp: 24.5°C; Tissue Temp: 22.0°C

Probe: EX3DV4 - SN7551; ConvF(7.69, 7.69, 7.69) @ 1860 MHz; Calibrated: 9/19/2019 Sensor-Surface: 1.4mm (Mechanical Surface Detection) Electronics: DAE4 Sn1333; Calibrated: 9/17/2019 Phantom: Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1792 Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7483)

Mode: LTE Band 25 (PCS), Body SAR, Back side, Low.ch, 20 MHz Bandwidth, QPSK, 1 RB, 50 RB Offset

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm Zoom Scan (6x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm Reference Value = 19.74 V/m; Power Drift = -0.04 dB Peak SAR (extrapolated) = 0.882 W/kg SAR(1 g) = 0.563 W/kg



DUT: ZNFK300TM; Type: Portable Handset; Serial: 10334

 $\begin{array}{l} \mbox{Communication System: UID 0, LTE Band 25 (PCS); Frequency: 1860 MHz; Duty Cycle: 1:1 \\ Medium: 1900 Body; Medium parameters used: \\ f = 1860 MHz; \mbox{σ} = 1.521 \mbox{ S/m}; \mbox{ϵ}_r = 52.157; \mbox{ρ} = 1000 \mbox{ kg/m}^3 \\ \mbox{Phantom section: Flat Section; Space: 1.0 cm} \end{array}$

Test Date: 03/16/2020; Ambient Temp: 24.5°C; Tissue Temp: 22.0°C

Probe: EX3DV4 - SN7551; ConvF(7.69, 7.69, 7.69) @ 1860 MHz; Calibrated: 9/19/2019 Sensor-Surface: 1.4mm (Mechanical Surface Detection) Electronics: DAE4 Sn1333; Calibrated: 9/17/2019 Phantom: Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1792 Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7483)

Mode: LTE Band 25 (PCS), Body SAR, Front side, Low.ch, 20 MHz Bandwidth, QPSK, 1 RB, 50 RB Offset

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm Zoom Scan (6x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm Reference Value = 25.23 V/m; Power Drift = -0.04 dB Peak SAR (extrapolated) = 1.60 W/kg SAR(1 g) = 0.892 W/kg



DUT: ZNFK300TM; Type: Portable Handset; Serial: 10318

 $\begin{array}{l} \mbox{Communication System: UID 0, _LTE Band 41 (Class 2); Frequency: 2593 MHz; Duty Cycle: 1:2.31 \\ \mbox{Medium: 2450 Body; Medium parameters used (interpolated):} \\ f = 2593 \mbox{ MHz; } \sigma = 2.21 \mbox{ S/m; } \epsilon_r = 51.568; \mbox{$\rho = 1000 kg/m^3$} \\ \mbox{Phantom section: Flat Section; Space: 1.0 cm} \end{array}$

Test Date: 03/02/2020; Ambient Temp: 23.0°C; Tissue Temp: 22.5°C

Probe: EX3DV4 - SN7547;, ConvF(7.18, 7.18, 7.18) @ 2593 MHz; Calibrated: 7/15/2019 Sensor-Surface: 1.4mm (Mechanical Surface Detection) Electronics: DAE4 Sn1323; Calibrated: 7/11/2019 Phantom: LeftTwin-SAM V5.0; Type: QD 000 P40 CD; Serial: TP1375 Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7483)

Mode: LTE Band 41 PC2, Body SAR, Back side, Mid.ch, 20 MHz Bandwidth, QPSK, 1 RB, 50 RB Offset

Area Scan (11x16x1): Measurement grid: dx=12mm, dy=12mm Zoom Scan (9x8x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 22.36 V/m; Power Drift = -0.04 dB Peak SAR (extrapolated) = 2.07 W/kg SAR(1 g) = 1.03 W/kg



DUT: ZNFK300TM; Type: Portable Handset; Serial: 10219

 $\begin{array}{l} \mbox{Communication System: UID 0, 802.11b; Frequency: 2412 MHz; Duty Cycle: 1:1} \\ \mbox{Medium: 2450 Body; Medium parameters used (interpolated):} \\ \mbox{f} = 2412 \mbox{ MHz; } \sigma = 1.954 \mbox{ S/m; } \epsilon_r = 51.553; \mbox{ρ} = 1000 \mbox{ kg/m}^3 \\ \mbox{Phantom section: Flat Section; Space: 1.0 cm} \end{array}$

Test Date: 03/05/2020; Ambient Temp: 23.5°C; Tissue Temp: 23.0°C

Probe: EX3DV4 - SN7547; ConvF(7.3, 7.3, 7.3) @ 2412 MHz; Calibrated: 7/15/2019 Sensor-Surface: 1.4mm (Mechanical Surface Detection) Electronics: DAE4 Sn1323; Calibrated: 7/11/2019 Phantom: LeftTwin-SAM V5.0; Type: QD 000 P40 CD; Serial: TP1375 Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7483)

Mode: IEEE 802.11b, 22 MHz Bandwidth, Body SAR, Ch 1, 1 Mbps, Back Side

Area Scan (11x17x1): Measurement grid: dx=12mm, dy=12mm Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 6.983 V/m; Power Drift = 0.02 dB Peak SAR (extrapolated) = 1.06 W/kg SAR(1 g) = 0.497 W/kg



0 dB = 1.00 W/kg = 0.00 dBW/kg

DUT: ZNFK300TM; Type: Portable Handset; Serial: 10227

Communication System: UID 0, 802.11a 5.2-5.8 GHz Band; Frequency: 5825 MHz; Duty Cycle: 1:1 Medium: 5200-5800 Body; Medium parameters used: f = 5825 MHz; $\sigma = 6.263$ S/m; $\epsilon_r = 46.342$; $\rho = 1000$ kg/m³ Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03/09/2020; Ambient Temp: 22.5°C; Tissue Temp: 22.3°C

Probe: EX3DV4 - SN7409; ConvF(4.23, 4.23, 4.23) @ 5825 MHz; Calibrated: 6/19/2019 Sensor-Surface: 1.4mm (Mechanical Surface Detection) Electronics: DAE4 Sn1334; Calibrated: 6/20/2019 Phantom: Front; Type: QD 000 P40 CD; Serial: 1686 Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7483)

Mode: IEEE 802.11a, UNII-3, 20 MHz Bandwidth, Body SAR, Ch 165, 6 Mbps, Back Side

Area Scan (13x22x1): Measurement grid: dx=10mm, dy=10mm Zoom Scan (7x7x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4 Reference Value = 0.9430 V/m; Power Drift = -0.12 dB Peak SAR (extrapolated) = 2.59 W/kg SAR(1 g) = 0.541 W/kg



DUT: ZNFK300TM; Type: Portable Handset; Serial: 10219

Communication System: UID 0, Bluetooth; Frequency: 2441 MHz; Duty Cycle: 1:1.307 Medium: 2450 Body Medium parameters used (interpolated): f = 2441 MHz; $\sigma = 2.026$ S/m; $\epsilon_r = 52.219$; $\rho = 1000$ kg/m³ Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03/16/2020; Ambient Temp: 23.2°C; Tissue Temp: 22.5°C

Probe: EX3DV4 - SN7547; ConvF(7.3, 7.3, 7.3) @ 2441 MHz; Calibrated: 7/15/2019 Sensor-Surface: 1.4mm (Mechanical Surface Detection) Electronics: DAE4 Sn1323; Calibrated: 7/11/2019 Phantom: LeftTwin-SAM V5.0; Type: QD 000 P40 CD; Serial: TP1375 Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7483)

Mode: Bluetooth, Body SAR, Ch 39, 1 Mbps, Back Side

Area Scan (11x17x1): Measurement grid: dx=12mm, dy=12mm Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 3.360 V/m; Power Drift = 0.18 dB Peak SAR (extrapolated) = 0.0440 W/kg SAR(1 g) = 0.020 W/kg



0 dB = 0.0344 W/kg = -14.63 dBW/kg

DUT: ZNFK300TM; Type: Portable Handset; Serial: 10227

Communication System: UID 0, 802.11a 5.2-5.8 GHz Band; Frequency: 5825 MHz; Duty Cycle: 1:1 Medium: 5200-5800 Body; Medium parameters used: f = 5825 MHz; $\sigma = 6.295$ S/m; $\epsilon_r = 46.355$; $\rho = 1000$ kg/m³ Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03/17/2020; Ambient Temp: 22.8°C; Tissue Temp: 22.3°C

Probe: EX3DV4 - SN7409; ConvF(4.23, 4.23, 4.23) @ 5825 MHz; Calibrated: 6/19/2019 Sensor-Surface: 1.4mm (Mechanical Surface Detection) Electronics: DAE4 Sn1334; Calibrated: 6/20/2019 Phantom: Front; Type: QD 000 P40 CD; Serial: 1686 Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7483)

Mode: IEEE 802.11a, UNII-3, 20 MHz Bandwidth, Body SAR, Ch 165, 6 Mbps, Back Side

Zoom Scan (31x28x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4 Reference Value = 2.825 V/m; Power Drift = -0.11 dB Peak SAR (extrapolated) = 2.40 W/kg SAR(1 g) = 0.529 W/kg



DUT: ZNFK300TM; Type: Portable Handset; Serial: 10219

Communication System: UID 0, Bluetooth; Frequency: 2441 MHz; Duty Cycle: 1:1.307 Medium: 2450 Body; Medium parameters used (interpolated): f = 2441 MHz; $\sigma = 2.026$ S/m; $\varepsilon_r = 52.219$; $\rho = 1000$ kg/m³ Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03/16/2020; Ambient Temp: 23.2°C; Tissue Temp: 22.5°C

Probe: EX3DV4 - SN7547; ConvF(7.3, 7.3, 7.3) @ 2441 MHz; Calibrated: 7/15/2019 Sensor-Surface: 1.4mm (Mechanical Surface Detection) Electronics: DAE4 Sn1323; Calibrated: 7/11/2019 Phantom: LeftTwin-SAM V5.0; Type: QD 000 P40 CD; Serial: TP1375 Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7483)

Mode: Bluetooth, Body SAR, Ch 39, 1 Mbps, Back Side

Zoom Scan (22x22x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mmReference Value = 1.321 V/m; Power Drift = 0.20 dB Peak SAR (extrapolated) = 0.0670 W/kg SAR(1 g) = 0.028 W/kg



DUT: ZNFK300TM; Type: Portable Handset

Mode: IEEE 802.11a, UNII-3, 20 MHz Bandwidth, Body SAR, Ch 165, 6 Mbps, Back Side, Scaling Factor: 1.101

Communication System: UID 0, 802.11a 5.2-5.8 GHz Band; Frequency: 5825 MHz; Duty Cycle: 1:1 Medium: 5200-5800 Body; Medium parameters used: f = 5825 MHz; $\sigma = 6.295$ S/m; $\varepsilon_r = 46.355$; $\rho = 1000$ kg/m³ Phantom section: Flat Section; Space: 1.0 cm

Mode: Bluetooth, Body SAR, Ch 39, 1 Mbps, Back Side, Scaling Factor: 1.730

 $\begin{array}{l} \mbox{Communication System: UID 0, Bluetooth; Frequency: 2441 MHz; Duty Cycle: 1:1.2936} \\ \mbox{Medium: 2450 Body; Medium parameters used (interpolated):} \\ f = 2441 \mbox{ MHz; } \sigma = 2.026 \mbox{ S/m; } \epsilon_r = 52.219; \mbox{ } \rho = 1000 \mbox{ kg/m}^3 \\ \mbox{Phantom section: Flat Section; Space: 1.0 cm} \end{array}$

Multi Band Result: SAR(1 g) = 0.605 W/kg



DUT: Dipole 750 MHz; Type: D750V3; Serial: 1054

 $\begin{array}{l} \mbox{Communication System: UID 0, CW; Frequency: 750 MHz; Duty Cycle: 1:1 \\ \mbox{Medium: 750 Head Medium parameters used:} \\ \mbox{f} = 750 \mbox{ MHz; } \sigma = 0.868 \mbox{ S/m; } \epsilon_r = 40.444; \mbox{ρ} = 1000 \mbox{ kg/m}^3 \\ \mbox{Phantom section: Flat Section; Space: 1.5cm} \end{array}$

Test Date: 02/26/2020; Ambient Temp: 21.2°C; Tissue Temp: 20.4°C

Probe: EX3DV4 - SN7410; ConvF(9.95, 9.95, 9.95) @ 750 MHz; Calibrated: 7/16/2019 Sensor-Surface: 1.4mm (Mechanical Surface Detection) Electronics: DAE4 Sn1322; Calibrated: 7/11/2019 Phantom: Twin-SAM V8.0; Type: QD 000 P41 Ax; Serial: 1966 Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7483)

750 MHz System Verification at 23.0 dBm (200 mW)

Area Scan (7x15x1): Measurement grid: dx=15mm, dy=15mmZoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mmPeak SAR (extrapolated) = 2.49 W/kg SAR(1 g) = 1.68 W/kg Deviation(1 g) = 1.33%



DUT: Dipole 835 MHz; Type: D835V2; Serial: 4d133

 $\begin{array}{l} \mbox{Communication System: UID 0, CW; Frequency: 835 MHz; Duty Cycle: 1:1 \\ \mbox{Medium: 835 Head; Medium parameters used:} \\ \mbox{f} = 835 \mbox{ MHz; } \sigma = 0.878 \mbox{ S/m; } \epsilon_r = 39.76; \mbox{ρ} = 1000 \mbox{ kg/m}^3 \\ \mbox{Phantom section: Flat Section; Space: 1.5 cm} \end{array}$

Test Date: 03/02/2020; Ambient Temp: 22.7°C; Tissue Temp: 21.3°C

Probe: EX3DV4 - SN7406; ConvF(9.78, 9.78, 9.78) @ 835 MHz; Calibrated: 5/16/2019 Sensor-Surface: 1.4mm (Mechanical Surface Detection) Electronics: DAE4 Sn728; Calibrated: 5/8/2019 Phantom: Twin-SAM V5.0 Left 30; Type: QD 000 P40 CD; Serial: 1715 Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7483)

835 MHz System Verification at 23.0 dBm (200 mW)

Area Scan (7x14x1): Measurement grid: dx=15mm, dy=15mmZoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mmPeak SAR (extrapolated) = 2.85 W/kg SAR(1 g) = 1.89 W/kg Deviation(1 g) = 0.21%



DUT: Dipole 1750 MHz; Type: D1750V2; Serial: 1150

Communication System: UID 0, CW; Frequency: 1750 MHz; Duty Cycle: 1:1 Medium: 1750 Head Medium parameters used: f = 1750 MHz; $\sigma = 1.342$ S/m; $\epsilon_r = 38.416$; $\rho = 1000$ kg/m³ Phantom section: Flat Section; Space: 1.0 cm

Test Date: 02/26/2020; Ambient Temp: 21.2°C; Tissue Temp: 20.40°C

Probe: EX3DV4 - SN7410; ConvF(8.46, 8.46, 8.46) @ 1750 MHz; Calibrated: 7/16/2019 Sensor-Surface: 1.4mm (Mechanical Surface Detection) Electronics: DAE4 Sn1322; Calibrated: 7/11/2019 Phantom: Twin-SAM V8.0; Type: QD 000 P41 Ax; Serial: 1966 Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7483)

1750 MHz System Verification at 20.0 dBm (100 mW)

Area Scan (7x9x1): Measurement grid: dx=15mm, dy=15mm Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm Peak SAR (extrapolated) = 6.96 W/kgSAR(1 g) = 3.77 W/kgDeviation(1 g) = 3.29%



DUT: Dipole 1900 MHz; Type: D1900V2; Serial: 5d080

Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1 Medium: 1900 Head Medium parameters used: f = 1900 MHz; $\sigma = 1.434 \text{ S/m}$; $\epsilon_r = 40.58$; $\rho = 1000 \text{ kg/m}^3$ Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03/05/2020; Ambient Temp: 22.7°C; Tissue Temp: 22.4°C

Probe: EX3DV4 - SN7409; ConvF(8.01, 8.01, 8.01) @ 1900 MHz; Calibrated: 6/19/2019 Sensor-Surface: 1.4mm (Mechanical Surface Detection) Electronics: DAE4 Sn1334; Calibrated: 6/20/2019 Phantom: Front; Type: QD 000 P40 CD; Serial: 1686 Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7483)

1900 MHz System Verification at 20.0 dBm (100 mW)

Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mmZoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mmPeak SAR (extrapolated) = 7.94 W/kg SAR(1 g) = 4.12 W/kg Deviation(1 g) = 3.52%



 $^{0 \}text{ dB} = 6.57 \text{ W/kg} = 8.18 \text{ dBW/kg}$

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: 719

Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1 Medium: 2450 Head Medium parameters used: f = 2450 MHz; $\sigma = 1.846$ S/m; $\epsilon_r = 38.414$; $\rho = 1000$ kg/m³ Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03/05/2020; Ambient Temp: 23.2°C; Tissue Temp: 23.0°C

Probe: EX3DV4 - SN3589; ConvF(6.85, 6.85, 6.85) @ 2450 MHz; Calibrated: 1/21/2020 Sensor-Surface: 1.4mm (Mechanical Surface Detection) Electronics: DAE4 Sn1558; Calibrated: 1/13/2020 Phantom: Twin-SAM V5.0 (30); Type: QD 000 P40 CD; Serial: 1647 Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7483)

2450 MHz System Verification at 20.0 dBm (100 mW)

Area Scan (8x9x1): Measurement grid: dx=12mm, dy=12mm Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm Peak SAR (extrapolated) = 11.4 W/kg SAR(1 g) = 5.42 W/kg Deviation(1 g) = 2.07%



DUT: Dipole 2600 MHz; Type: D2600V2; Serial: 1064

Communication System: UID 0, CW; Frequency: 2600 MHz; Duty Cycle: 1:1 Medium: 2450 Head Medium parameters used: $f = 2600 \text{ MHz}; \sigma = 1.98 \text{ S/m}; \epsilon_r = 37.763; \rho = 1000 \text{ kg/m}^3$ Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03/12/2020; Ambient Temp: 22.9°C; Tissue Temp: 21.2°C

Probe: EX3DV4 - SN3589; ConvF(6.6, 6.6, 6.6) @ 2600 MHz; Calibrated: 1/21/2020 Sensor-Surface: 1.4mm (Mechanical Surface Detection) Electronics: DAE4 Sn1558; Calibrated: 1/13/2020 Phantom: Twin-SAM V5.0 (30); Type: QD 000 P40 CD; Serial: 1647 Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

2600 MHz System Verification at 20.0 dBm (100 mW)

Area Scan (8x9x1): Measurement grid: dx=12mm, dy=12mmZoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mmPeak SAR (extrapolated) = 13.2 W/kg SAR(1 g) = 5.87 W/kg Deviation(1 g) = 1.03%



0 dB = 10.2 W/kg = 10.09 dBW/kg

DUT: Dipole 5 GHz; Type: D5GHzV2; Serial: 1057

Communication System: UID 0, CW; Frequency: 5250 MHz; Duty Cycle: 1:1 Medium: 5200-5800 Head Medium parameters used: f = 5250 MHz; $\sigma = 4.582$ S/m; $\epsilon_r = 35.399$; $\rho = 1000$ kg/m³ Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03/09/2020; Ambient Temp: 22.1°C; Tissue Temp: 21.1°C

Probe: EX3DV4 - SN7406; ConvF(5.54, 5.54, 5.54) @ 5250 MHz; Calibrated: 5/16/2019 Sensor-Surface: 1.4mm (Mechanical Surface Detection) Electronics: DAE4 Sn728; Calibrated: 5/8/2019 Phantom: Twin-SAM V5.0 Left 30; Type: QD 000 P40 CD; Serial: 1715 Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7483)

5250 MHz System Verification at 17.0 dBm (50 mW)

Area Scan (7x7x1): Measurement grid: dx=10mm, dy=10mmZoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4 Peak SAR (extrapolated) = 14.9 W/kg SAR(1 g) = 3.68 W/kg Deviation(1 g) = -7.07%



0 dB = 10.0 W/kg = 10.00 dBW/kg

DUT: Dipole 5 GHz; Type: D5GHzV2; Serial: 1057

Communication System: UID 0, CW; Frequency: 5600 MHz; Duty Cycle: 1:1 Medium: 5200-5800 Head Medium parameters used: f = 5600 MHz; $\sigma = 4.966$ S/m; $\epsilon_r = 34.796$; $\rho = 1000$ kg/m³ Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03/09/2020; Ambient Temp: 22.1°C; Tissue Temp: 21.1°C

Probe: EX3DV4 - SN7406; ConvF(4.94, 4.94, 4.94) @ 5600 MHz; Calibrated: 5/16/2019 Sensor-Surface: 1.4mm (Mechanical Surface Detection) Electronics: DAE4 Sn728; Calibrated: 5/8/2019 Phantom: Twin-SAM V5.0 Left 30; Type: QD 000 P40 CD; Serial: 1715 Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7483)

5600 MHz System Verification at 17.0 dBm (50 mW)

Area Scan (7x7x1): Measurement grid: dx=10mm, dy=10mm Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4 Peak SAR (extrapolated) = 17.6 W/kg SAR(1 g) = 3.9 W/kg

Deviation(1 g) = -7.25%



0 dB = 10.0 W/kg = 10.00 dBW/kg

DUT: Dipole 5 GHz; Type: D5GHzV2; Serial: 1057

Communication System: UID 0, CW; Frequency: 5750 MHz; Duty Cycle: 1:1 Medium: 5200-5800 Head Medium parameters used: f = 5750 MHz; $\sigma = 5.138$ S/m; $\epsilon_r = 34.547$; $\rho = 1000$ kg/m³ Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03/09/2020; Ambient Temp: 22.1°C; Tissue Temp: 21.1°C

Probe: EX3DV4 - SN7406; ConvF(5.23, 5.23, 5.23) @ 5750 MHz; Calibrated: 5/16/2019 Sensor-Surface: 1.4mm (Mechanical Surface Detection) Electronics: DAE4 Sn728; Calibrated: 5/8/2019 Phantom: Twin-SAM V5.0 Left 30; Type: QD 000 P40 CD; Serial: 1715 Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7483)

5750 MHz System Verification at 17.0 dBm (50 mW)

Area Scan (7x7x1): Measurement grid: dx=10mm, dy=10mmZoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4 Peak SAR (extrapolated) = 17.8 W/kg SAR(1 g) = 3.78 W/kg Deviation(1 g) = -6.09%



0 dB = 10.0 W/kg = 10.00 dBW/kg

DUT: Dipole 750 MHz; Type: D750V3; Serial: 1161

 $\begin{array}{l} \mbox{Communication System: UID 0, CW; Frequency: 750 MHz; Duty Cycle: 1:1 \\ \mbox{Medium: 750 Body Medium parameters used:} \\ \mbox{f} = 750 \mbox{ MHz; } \sigma = 0.937 \mbox{ S/m; } \epsilon_r = 53.527; \mbox{ρ} = 1000 \mbox{ kg/m}^3 \\ \mbox{Phantom section: Flat Section; Space: 1.5 cm} \end{array}$

Test Date: 03/09/2020; Ambient Temp: 23.0°C; Tissue Temp: 21.5°C

Probe: EX3DV4 - SN7547; ConvF(9.81, 9.81, 9.81) @ 750 MHz; Calibrated: 7/15/2019 Sensor-Surface: 1.4mm (Mechanical Surface Detection) Electronics: DAE4 Sn1323; Calibrated: 7/11/2019 Phantom: LeftTwin-SAM V5.0; Type: QD 000 P40 CD; Serial: TP1375 Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7483)

750 MHz System Verification at 23.0 dBm (200 mW)

Area Scan (7x15x1): Measurement grid: dx=15mm, dy=15mmZoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mmPeak SAR (extrapolated) = 2.54 W/kg SAR(1 g) = 1.69 W/kg Deviation(1 g) = 0.24%



0 dB = 2.26 W/kg = 3.54 dBW/kg

DUT: Dipole 835 MHz; Type: D835V2; Serial: 4d047

 $\begin{array}{l} \mbox{Communication System: UID 0, CW; Frequency: 835 MHz; Duty Cycle: 1:1 \\ \mbox{Medium: 835 Body; Medium parameters used:} \\ \mbox{f} = 835 \mbox{ MHz; } \sigma = 0.961 \mbox{ S/m; } \epsilon_r = 54.192; \mbox{ρ} = 1000 \mbox{ kg/m}^3 \\ \mbox{Phantom section: Flat Section; Space: 1.5 cm} \end{array}$

Test Date: 03/04/2020; Ambient Temp: 21.9°C; Tissue Temp: 21.3°C

Probe: EX3DV4 - SN7488; ConvF(11.04, 11.04, 11.04) @ 835 MHz; Calibrated: 1/21/2020 Sensor-Surface: 1.4mm (Mechanical Surface Detection) Electronics: DAE4 Sn1530; Calibrated: 1/13/2020 Phantom: Twin-SAM V4.0 Left 30; Type: QD 000 P40 CC; Serial: 1687 Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7483)

835 MHz System Verification at 23.0 dBm (200 mW)

Area Scan (7x14x1): Measurement grid: dx=15mm, dy=15mmZoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mmPeak SAR (extrapolated) = 2.72 W/kg SAR(1 g) = 1.79 W/kg Deviation(1 g) = -5.49%



0 dB = 2.40 W/kg = 3.80 dBW/kg

DUT: Dipole 835 MHz; Type: D835V2; Serial: 4d132

 $\begin{array}{l} \mbox{Communication System: UID 0, CW; Frequency: 835 MHz; Duty Cycle: 1:1 \\ \mbox{Medium: 835 Body Medium parameters used:} \\ \mbox{f} = 835 \mbox{ MHz; } \sigma = 0.956 \mbox{ S/m; } \epsilon_r = 54.915; \mbox{ρ} = 1000 \mbox{ kg/m}^3 \\ \mbox{Phantom section: Flat Section; Space: 1.5 cm} \end{array}$

Test Date: 03/16/2020; Ambient Temp: 22.7°C; Tissue Temp: 22.0°C

Probe: EX3DV4 - SN7406; ConvF(9.78, 9.78, 9.78) @ 835 MHz; Calibrated: 5/16/2019 Sensor-Surface: 1.4mm (Mechanical Surface Detection) Electronics: DAE4 Sn728; Calibrated: 5/8/2019 Phantom: Twin-SAM V5.0 Left 30; Type: QD 000 P40 CD; Serial: 1715 Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7483)

835 MHz System Verification at 23.0 dBm (200 mW)

Area Scan (7x14x1): Measurement grid: dx=15mm, dy=15mmZoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mmPeak SAR (extrapolated) = 2.98 W/kg SAR(1 g) = 1.98 W/kg Deviation(1 g) = -0.60%



DUT: Dipole 1750 MHz; Type: D1750V2; Serial: 1148

Communication System: UID 0, CW; Frequency: 1750 MHz; Duty Cycle: 1:1 Medium: 1750 Body; Medium parameters used: f = 1750 MHz; $\sigma = 1.474$ S/m; $\epsilon_r = 55.625$; $\rho = 1000$ kg/m³ Phantom section: Flat Section; Space: 1.0 cm

Test Date: 02/26/2020; Ambient Temp: 21.2°C; Tissue Temp: 20.9°C

Probe: EX3DV4 - SN7357; ConvF(8.26, 8.26, 8.26) @ 1750 MHz; Calibrated: 4/24/2019 Sensor-Surface: 1.4mm (Mechanical Surface Detection) Electronics: DAE4 Sn1407; Calibrated: 4/18/2019 Phantom: Right Back Twin-SAM V5.0 (30); Type: QD 000 P40 CD; Serial: 1692 Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7483)

1750 MHz System Verification at 20.0 dBm (100 mW)

Area Scan (7x9x1): Measurement grid: dx=15mm, dy=15mm Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm Peak SAR (extrapolated) = 7.06 W/kg SAR(1 g) = 3.85 W/kg Deviation(1 g) = 2.12%



0 dB = 5.85 W/kg = 7.67 dBW/kg

DUT: Dipole 1750 MHz; Type: D1750V2; Serial: 1148

Communication System: UID 0, CW; Frequency: 1750 MHz; Duty Cycle: 1:1 Medium: 1750 Body; Medium parameters used: f = 1750 MHz; $\sigma = 1.469$ S/m; $\epsilon_r = 55.727$; $\rho = 1000$ kg/m³ Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03/02/2020; Ambient Temp: 22.8°C; Tissue Temp: 22.0°C

Probe: EX3DV4 - SN7357; ConvF(8.26, 8.26, 8.26) @ 1750 MHz; Calibrated: 4/24/2019 Sensor-Surface: 1.4mm (Mechanical Surface Detection) Electronics: DAE4 Sn1407; Calibrated: 4/18/2019 Phantom: Right Back Twin-SAM V5.0 (30); Type: QD 000 P40 CD; Serial: 1692 Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7483)

1750 MHz System Verification at 20.0 dBm (100 mW)

Area Scan (7x9x1): Measurement grid: dx=15mm, dy=15mm Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm Peak SAR (extrapolated) = 7.17 W/kg SAR(1 g) = 3.91 W/kg Deviation(1 g) = 3.71%



0 dB = 5.97 W/kg = 7.76 dBW/kg

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: 5d148

Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1 Medium: 1900 Body Medium parameters used: f = 1900 MHz; $\sigma = 1.563$ S/m; $\epsilon_r = 51.47$; $\rho = 1000$ kg/m³ Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03/12/2020; Ambient Temp: 22.0°C; Tissue Temp: 23.5°C

Probe: EX3DV4 - SN7571; ConvF(7.56, 7.56, 7.56) @ 1900 MHz; Calibrated: 12/11/2019 Sensor-Surface: 1.4mm (Mechanical Surface Detection) Electronics: DAE4 Sn1533; Calibrated: 12/5/2019 Phantom: SAM Left; Type: QD000P40CC; Serial: TP: 1375 Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7483)

1900 MHz System Verification at 20.0 dBm (100 mW)

Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mmZoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mmPeak SAR (extrapolated) = 7.74 W/kg SAR(1 g) = 4.18 W/kg Deviation(1 g) = 6.91%



0 dB = 6.40 W/kg = 8.06 dBW/kg

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: 5d149

Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1 Medium: 1900 Body; Medium parameters used: f = 1900 MHz; $\sigma = 1.565$ S/m; $\epsilon_r = 52.022$; $\rho = 1000$ kg/m³ Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03/16/2020; Ambient Temp: 24.5°C; Tissue Temp: 22.0°C

Probe: EX3DV4 - SN7551; ConvF(7.69, 7.69, 7.69) @ 1900 MHz; Calibrated: 9/19/2019 Sensor-Surface: 1.4mm (Mechanical Surface Detection) Electronics: DAE4 Sn1333; Calibrated: 9/17/2019 Phantom: Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1792 Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7483)

1900 MHz System Verification at 20.0 dBm (100 mW)

Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mmZoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mmPeak SAR (extrapolated) = 7.64 W/kg SAR(1 g) = 4.1 W/kg Deviation(1 g) = 4.06%



0 dB = 6.36 W/kg = 8.03 dBW/kg

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: 797

Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1 Medium: 2450 Body; Medium parameters used: f = 2450 MHz; $\sigma = 2.039$ S/m; $\epsilon_r = 51.998$; $\rho = 1000$ kg/m³ Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03/02/2020; Ambient Temp: 23.0°C; Tissue Temp: 22.5°C

Probe: EX3DV4 - SN7547; ConvF(7.3, 7.3, 7.3) @ 2450 MHz; Calibrated: 7/15/2019 Sensor-Surface: 1.4mm (Mechanical Surface Detection) Electronics: DAE4 Sn1323; Calibrated: 7/11/2019 Phantom: LeftTwin-SAM V5.0; Type: QD 000 P40 CD; Serial: TP1375 Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7483)

2450 MHz System Verification at 20.0 dBm (100 mW)

Area Scan (8x9x1): Measurement grid: dx=12mm, dy=12mm Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm Peak SAR (extrapolated) = 10.5 W/kg SAR(1 g) = 5.07 W/kgDeviation(1 g) = -0.78%



0 dB = 8.40 W/kg = 9.24 dBW/kg

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: 719

Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1 Medium: 2450 Body; Medium parameters used: f = 2450 MHz; $\sigma = 1.997$ S/m; $\epsilon_r = 51.452$; $\rho = 1000$ kg/m³ Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03/05/2020; Ambient Temp: 23.5°C; Tissue Temp: 23.0°C

Probe: EX3DV4 - SN7547; ConvF(7.3, 7.3, 7.3) @ 2450 MHz; Calibrated: 7/15/2019 Sensor-Surface: 1.4mm (Mechanical Surface Detection) Electronics: DAE4 Sn1323; Calibrated: 7/11/2019 Phantom: LeftTwin-SAM V5.0; Type: QD 000 P40 CD; Serial: TP1375 Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7483)

2450 MHz System Verification at 20.0 dBm (100 mW)

Area Scan (8x9x1): Measurement grid: dx=12mm, dy=12mm Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm Peak SAR (extrapolated) = 10.5 W/kg SAR(1 g) = 5.03 W/kgDeviation(1 g) = -0.98%



0 dB = 8.39 W/kg = 9.24 dBW/kg

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: 797

Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1 Medium: 2450 Body Medium parameters used: f = 2450 MHz; $\sigma = 2.036$ S/m; $\varepsilon_r = 52.194$; $\rho = 1000$ kg/m³ Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03/16/2020; Ambient Temp: 23.2°C; Tissue Temp: 22.5°C

Probe: EX3DV4 - SN7547; ConvF(7.3, 7.3, 7.3) @ 2450 MHz; Calibrated: 7/15/2019 Sensor-Surface: 1.4mm (Mechanical Surface Detection) Electronics: DAE4 Sn1323; Calibrated: 7/11/2019 Phantom: LeftTwin-SAM V5.0; Type: QD 000 P40 CD; Serial: TP1375 Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7483)

2450 MHz System Verification at 20.0 dBm (100 mW)

Area Scan (8x9x1): Measurement grid: dx=12mm, dy=12mmZoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mmPeak SAR (extrapolated) = 10.4 W/kg SAR(1 g) = 5.05 W/kg Deviation(1 g) = -1.17%



0 dB = 8.36 W/kg = 9.22 dBW/kg

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: 1004

Communication System: UID 0, CW; Frequency: 2600 MHz; Duty Cycle: 1:1 Medium: 2450 Body; Medium parameters used: $f = 2600 \text{ MHz}; \sigma = 2.217 \text{ S/m}; \epsilon_r = 51.546; \rho = 1000 \text{ kg/m}^3$ Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03/02/2020; Ambient Temp: 23.0°C; Tissue Temp: 22.5°C

Probe: EX3DV4 - SN7547; ConvF(7.18, 7.18, 7.18) @ 2600 MHz; Calibrated: 7/15/2019 Sensor-Surface: 1.4mm (Mechanical Surface Detection) Electronics: DAE4 Sn1323; Calibrated: 7/11/2019 Phantom: LeftTwin-SAM V5.0; Type: QD 000 P40 CD; Serial: TP1375 Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7483)

2600 MHz System Verification at 20.0 dBm (100 mW)

Area Scan (8x9x1): Measurement grid: dx=12mm, dy=12mm Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm Peak SAR (extrapolated) = 12.1 W/kg SAR(1 g) = 5.61 W/kg Deviation(1 g) = 2.37%



0 dB = 9.62 W/kg = 9.83 dBW/kg

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: 1004

Communication System: UID 0, CW; Frequency: 2600 MHz; Duty Cycle: 1:1 Medium: 2450 Body Medium parameters used: f = 2600 MHz; $\sigma = 2.219$ S/m; $\epsilon_r = 51.753$; $\rho = 1000$ kg/m³ Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03/16/2020; Ambient Temp: 23.2°C; Tissue Temp: 22.5°C

Probe: EX3DV4 - SN7547; ConvF(7.18, 7.18, 7.18) @ 2600 MHz; Calibrated: 7/15/2019 Sensor-Surface: 1.4mm (Mechanical Surface Detection) Electronics: DAE4 Sn1323; Calibrated: 7/11/2019 Phantom: LeftTwin-SAM V5.0; Type: QD 000 P40 CD; Serial: TP1375 Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7483)

2600 MHz System Verification at 20.0 dBm (100 mW)

Area Scan (8x9x1): Measurement grid: dx=12mm, dy=12mm Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm Peak SAR (extrapolated) = 11.3 W/kg SAR(1 g) = 5.26 W/kg Deviation(1 g) = -4.01%



0 dB = 9.06 W/kg = 9.57 dBW/kg

DUT: Dipole 5 GHz; Type: D5GHzV2; Serial: 1191

Communication System: UID 0, CW; Frequency: 5250 MHz; Duty Cycle: 1:1 Medium: 5200-5800 Body Medium parameters used: f = 5250 MHz; $\sigma = 5.494$ S/m; $\epsilon_r = 47.286$; $\rho = 1000$ kg/m³ Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-09-2020; Ambient Temp: 22.5°C; Tissue Temp: 22.3°C

Probe: EX3DV4 - SN7409; ConvF(4.7, 4.7, 4.7) @ 5250 MHz; Calibrated: 6/19/2019 Sensor-Surface: 1.4mm (Mechanical Surface Detection) Electronics: DAE4 Sn1334; Calibrated: 6/20/2019 Phantom: Front; Type: QD 000 P40 CD; Serial: 1686 Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7483)

5250 MHz System Verification at 17.0 dBm (50 mW)

Area Scan (7x7x1): Measurement grid: dx=10mm, dy=10mmZoom Scan (8x8x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4 Peak SAR (extrapolated) = 14.6 W/kg SAR(1 g) = 3.61 W/kg Deviation(1 g) = -6.23%



⁰ dB = 8.58 W/kg = 9.33 dBW/kg

DUT: Dipole 5 GHz; Type: D5GHzV2; Serial: 1191

Communication System: UID 0, CW; Frequency: 5600 MHz; Duty Cycle: 1:1 Medium: 5200-5800 Body Medium parameters used: f = 5600 MHz; $\sigma = 5.953$ S/m; $\epsilon_r = 46.707$; $\rho = 1000$ kg/m³ Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-09-2020; Ambient Temp: 22.5°C; Tissue Temp: 22.3°C

Probe: EX3DV4 - SN7409; ConvF(4.22, 4.22, 4.22) @ 5600 MHz; Calibrated: 6/19/2019 Sensor-Surface: 1.4mm (Mechanical Surface Detection) Electronics: DAE4 Sn1334; Calibrated: 6/20/2019 Phantom: Front; Type: QD 000 P40 CD; Serial: 1686 Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7483)

5600 MHz System Verification at 17.0 dBm (50 mW)

Area Scan (7x7x1): Measurement grid: dx=10mm, dy=10mm Zoom Scan (8x8x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4 Peak SAR (extrapolated) = 17.8 W/kg SAR(1 g) = 3.98 W/kg Deviation(1 g) = 1.27%



DUT: Dipole 5 GHz; Type: D5GHzV2; Serial: 1191

Communication System: UID 0, CW; Frequency: 5750 MHz; Duty Cycle: 1:1 Medium: 5200-5800 Body Medium parameters used: f = 5750 MHz; $\sigma = 6.16$ S/m; $\epsilon_r = 46.428$; $\rho = 1000$ kg/m³ Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-09-2020; Ambient Temp: 22.5°C; Tissue Temp: 22.3°C

Probe: EX3DV4 - SN7409; ConvF(4.23, 4.23, 4.23) @ 5750 MHz; Calibrated: 6/19/2019 Sensor-Surface: 1.4mm (Mechanical Surface Detection) Electronics: DAE4 Sn1334; Calibrated: 6/20/2019 Phantom: Front; Type: QD 000 P40 CD; Serial: 1686 Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7483) 5750 MHz System Verification at 17.0 dBm (50 mW)

Area Scan (7x7x1): Measurement grid: dx=10mm, dy=10mm Zoom Scan (8x8x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4 Peak SAR (extrapolated) = 17.5 W/kg SAR(1 g) = 3.71 W/kg Deviation(1 g) = -3.51%



DUT: Dipole 5 GHz; Type: D5GHzV2; Serial: 1237

Communication System: UID 0, CW; Frequency: 5750 MHz; Duty Cycle: 1:1 Medium: 5200-5800 Body Medium parameters used: f = 5750 MHz; $\sigma = 6.21$ S/m; $\epsilon_r = 46.477$; $\rho = 1000$ kg/m³ Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-17-2020; Ambient Temp: 22.8°C; Tissue Temp: 22.3°C

Probe: EX3DV4 - SN7409; ConvF(4.23, 4.23, 4.23) @ 5750 MHz; Calibrated: 6/19/2019 Sensor-Surface: 1.4mm (Mechanical Surface Detection) Electronics: DAE4 Sn1334; Calibrated: 6/20/2019 Phantom: Front; Type: QD 000 P40 CD; Serial: 1686 Measurement SW: DASY52, Version 52.10 (4);SEMCAD X Version 14.6.14 (7483)

5750 MHz System Verification at 17.0 dBm (50 mW)

Area Scan (7x7x1): Measurement grid: dx=10mm, dy=10mmZoom Scan (8x8x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4 Peak SAR (extrapolated) = 18.1 W/kg SAR(1 g) = 3.74 W/kg Deviation(1 g) = -1.45%



 $0 \ dB = 9.38 \ W/kg = 9.72 \ dBW/kg$
APPENDIX C: SAR TISSUE SPECIFICATIONS

Measurement Procedure for Tissue verification:

- 1) The network analyzer and probe system was configured and calibrated.
- 2) The probe was immersed in the tissue. The tissue was placed in a nonmetallic container. Trapped air bubbles beneath the flange were minimized by placing the probe at a slight angle.
- 3) The complex admittance with respect to the probe aperture was measured
- 4) The complex relative permittivity ɛ can be calculated from the below equation (Pournaropoulos and Misra):

$$Y = \frac{j2\omega\varepsilon_r\varepsilon_0}{\left[\ln(b/a)\right]^2} \int_a^b \int_a^b \int_0^\pi \cos\phi' \frac{\exp\left[-j\omega r(\mu_0\varepsilon_r\varepsilon_0)^{1/2}\right]}{r} d\phi' d\rho' d\rho$$

where Y is the admittance of the probe in contact with the sample, the primed and unprimed coordinates refer to source and observation points, respectively, $r^2 = \rho^2 + \rho'^2 - 2\rho\rho' \cos \phi'$, ω is the angular frequency, and $j = \sqrt{-1}$.

3 Composition / Information on ingredients

CAS: 107-21-1	Ethanediol	>1.0-4.9%
EINECS: 203-473-3	STOT RE 2, H373;	
Reg.nr.: 01-2119456816-28-0000	Acute Tox. 4, H302	
CAS: 68608-26-4	Sodium petroleum sulfonate	< 2.9%
EINECS: 271-781-5	Eye Irrit. 2, H319	0.0000000
Reg.nr.: 01-2119527859-22-0000	- 53 - 53	
CAS: 107-41-5	Hexylene Glycol / 2-Methyl-pentane-2,4-diol	< 2.9%
EINECS: 203-489-0	Skin Irrit. 2, H315; Eye Irrit. 2, H319	
Reg.nr.: 01-2119539582-35-0000		
CAS: 68920-66-1	Alkoxylated alcohol, > C ₁₆	< 2.0%
NLP: 500-236-9	Aquatic Chronic 2, H411;	
Reg.nr.: 01-2119489407-26-0000	Skin Irrit. 2, H315; Eye Irrit. 2, H319	

For the wording of the listed risk phrases refer to section 16. Not mentioned CAS-, EINECS- or registration numbers are to be regarded as Proprietary/Confidential. The specific chemical identity and/or exact percentage concentration of proprietary components is withheld as a trade secret.

Figure C-1

Note: Liquid recipes are proprietary SPEAG. Since the composition is approximate to the actual liquids utilized, the manufacturer tissue-equivalent liquid data sheets are provided below.

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Schmid & Partner Engineering AG S peag

Zeughausstrasse 43, 8004 Zurich, Switzerland Phone +41 44 245 9700, Fax +41 44 245 9779 info@speag.com, http://www.speag.com

Measurement Certificate / Material Test

Item Name	Body Tissue Simulating Liquid (MBBL600-6000V6)	
Product No.	SL AAM U16 BC (Batch: 181029-1)	
Manufacturer	SPEAG	

Measurement Method TSL dielectric parameters measured using calibrated DAK probe.

Target Parameters Target parameters as defined in the KDB 865664 compliance standard.

on Condition

Test Condition		
Ambient Condition	22°C ; 30% humidity	
TSL Temperature	22°C	
Test Date	30-Oct-18	
Operator	CL	
Additional Inform	ation	
TSL Density		
TSL Heat-capacity		

Results

2	Measu	ured		Targe	rt	Diff.to Targ	get [%]	1000			
f [MHz]	0'	e"	sigma	eps	sigma	∆-eps	∆-sigma	15.0		123	
800	55.1	21.3	0.95	55.3	0.97	-0.4	-2.1	10.0	_		
825	55.1	20.8	0.96	55.2	0.98	-0.3	-2.0		100		
835	55.1	20.6	0.96	55.1	0.99	0.0	-2.5	2 5.0	1000		
850	55.1	20.4	0.96	55.2	0.99	-0.1	-3.0	1 0.0	-	-	-
900	55.0	19.7	0.98	55.0	1.05	0.0	-6.7	Ē			
1400	54.2	15.6	1.22	54.1	1.28	0.2	-4.7	a -5.0	100		
1450	54,1	15.4	1.24	54.0	1.30	0.2	-4.6	a-10.0	_		
1500	54.1	15.3	1.27	53.9	1.33	0.3	-4.5		14		
1550	54.0	15.1	1.30	53.9	1.36	0.2	-4.4	-15.0	500	1500	- 3
1600	53.9	15.0	1.33	53.8	1.39	0.2	-4.3				
1625	53.9	14.9	1.35	53.8	1.41	0.3	-4.3				
1640	53.9	14.9	1.36	53.7	1.42	0.3	-4.2	15.0			
1650	53.8	14.9	1.36	53.7	1.43	0.2	-4.9	15.0	1-30		
1700	53.8	14.8	1.40	53.6	1.46	0.4	-4.1	10.0	-		_
1750	53.7	14.7	1.43	53.4	1.49	0.5	-4.0	38 00		1	
1800	53.7	14.6	1.46	53.3	1.52	0.8	-3.9	Atta	15570		
1810	53.7	14.6	1.47	53.3	1.52	0.8	-3.3	0.0	-	- 1	
1825	53.7	14.6	1.48	53.3	1.52	0.8	-2.6	8	Λ	2	
1850	53.6	14.5	1.50	53.3	1.52	0.6	-1.3	20.0	10	/	
1900	53.5	14.5	1.53	53.3	1.52	0.4	0.7	-10.0	-		
1950	53.5	14.5	1.57	53.3	1.52	0.4	3.3	15.0	1		
2000	53.4	14.4	1.60	53.3	1.52	0.2	5.3	-15.0	00	1500	-
2050	53.4	14.4	1.64	53.2	1.57	0.3	4.5				F
2100	53.3	14.4	1.68	53.2	1.62	0.2	3.7				
2150	53.3	14.4	1.72	53.1	1.66	0.4	3.6				
2200	53.2	14.4	1.75	53.0	1.71	0.3	2.9	3500	51.1	15.5	14
2250	53.1	14.4	1.81	53.0	1.76	0.2	2.8	3700	50.8	15.7	2
2300	53.1	14.4	1.85	52.9	1.81	0.4	2.2	5200	48.1	18.2	. 8
2350	53.0	14.5	1.89	52.8	1.85	0.3	2.2	5250	48.0	18.3	E
	52.9	14.5	1.94	52.8	1.90	0.2	2.1	5300	47.9	18.4	ε
2400	Contraction and		1 98	52.7	1.95	0.4	1.5	5500	47.5	18.6	-
2400 2450	52.9	14.5	1.00	-						-	-
2400 2450 2500	52.9 52.8	14.5 14.6	2.03	52.6	2.02	0.3	0.5	5600	47.3	18.8	Ę
2400 2450 2500 2550	52.9 52.8 52.7	14.5 14.6 14.6	2.03	52.6 52.6	2.02 2.09	0.3 0.2	0.5 -1.0	5600 5700	47.3 47.1	18.8 18.9	10 E





3500	51.1	15.5	3.02	51.3	3.31	-0.4	-8.8
3700	50.8	15.7	3.24	51.1	3.55	-0.5	-8.8
5200	48.1	18.2	5.27	49.0	5.30	-1.8	-0.6
5250	48.0	18.3	5.34	49.0	5.36	-1.9	-0.4
5300	47.9	18.4	5.41	48.9	5.42	-2.0	-0.2
5500	47.5	18.6	5.70	48.6	5.65	-2.2	0.8
5600	47.3	18.8	5.84	48.5	5.77	-2.3	1.3
5700	47.1	18.9	5.99	48.3	5.88	-2.5	1.8
5800	47.0	19.0	6.14	48.2	6.00	-2.6	2.3

TSL Dielectric Parameters

Figure C-2 600 – 5800 MHz Body Tissue Equivalent Matter

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APPENDIX D: SAR SYSTEM VALIDATION

Per FCC KDB Publication 865664 D02v01r02, SAR system validation status should be documented to confirm measurement accuracy. The SAR systems (including SAR probes, system components and software versions) used for this device were validated against its performance specifications prior to the SAR measurements. Reference dipoles were used with the required tissue- equivalent media for system validation, according to the procedures outlined in FCC KDB Publication 865664 D01v01r04 and IEEE 1528-2013. Since SAR probe calibrations are frequency dependent, each probe calibration point was validated at a frequency within the valid frequency range of the probe calibration point, using the system that normally operates with the probe for routine SAR measurements and according to the required tissue-equivalent media.

A tabulated summary of the system validation status including the validation date(s), measurement frequencies, SAR probes and tissue dielectric parameters has been included.

CAD	Free		Drohe			Cand	Derm	CM	VALIDATION		MOD	. VALIDATI	ON
System	(MHz)	Date	SN	Probe C	Cal Point	(σ)	erm. (εr)	SENSITIVITY	PROBE LINEARITY	PROBE ISOTROPY	MOD. TYPE	DUTY FACTOR	PAR
L	750	9/24/2019	7410	750	Head	0.878	42.471	PASS	PASS	PASS	N/A	N/A	N/A
Н	835	3/2/2020	7406	835	Head	0.878	39.760	PASS	PASS	PASS	GMSK	PASS	N/A
L	1750	9/24/2019	7410	1750	Head	1.351	40.190	PASS	PASS	PASS	N/A	N/A	N/A
G	1900	7/3/2019	7409	1900	Head	1.460	40.732	PASS	PASS	PASS	GMSK	PASS	N/A
E	2450	2/5/2020	3589	2450	Head	1.823	38.835	PASS	PASS	PASS	TDD/OFDM	PASS	PASS
E	2600	2/5/2020	3589	2600	Head	1.933	38.635	PASS	PASS	PASS	TDD	PASS	N/A
Н	5250	12/7/2019	7406	5250	Head	4.709	35.885	PASS	PASS	PASS	OFDM	N/A	PASS
Н	5600	12/7/2019	7406	5600	Head	5.120	35.211	PASS	PASS	PASS	OFDM	N/A	PASS
Н	5750	12/7/2019	7406	5750	Head	5.309	34.961	PASS	PASS	PASS	OFDM	N/A	PASS
K	750	9/13/2019	7547	750	Body	0.961	55.740	PASS	PASS	PASS	N/A	N/A	N/A
D	835	2/20/2020	7488	835	Body	1.001	53.450	PASS	PASS	PASS	GMSK	PASS	N/A
Н	835	1/6/2020	7406	835	Body	0.978	54.174	PASS	PASS	PASS	GMSK	PASS	N/A
I	1750	5/21/2019	7357	1750	Body	1.442	55.384	PASS	PASS	PASS	N/A	N/A	N/A
J	1900	1/1/2020	7571	1900	Body	1.579	51.919	PASS	PASS	PASS	GMSK	PASS	N/A
Р	1900	10/8/2019	7551	1900	Body	1.542	51.760	PASS	PASS	PASS	GMSK	PASS	N/A
K	2450	9/6/2019	7547	2450	Body	1.996	51.898	PASS	PASS	PASS	TDD/OFDM	PASS	PASS
K	2600	9/5/2019	7547	2600	Body	2.716	52.040	PASS	PASS	PASS	TDD	PASS	N/A
G	5250	10/4/2019	7409	5250	Body	5.223	47.070	PASS	PASS	PASS	OFDM	N/A	PASS
G	5600	10/7/2019	7409	5600	Body	5.884	47.080	PASS	PASS	PASS	OFDM	N/A	PASS
G	5750	10/7/2019	7409	5750	Body	6.111	46.780	PASS	PASS	PASS	OFDM	N/A	PASS

Table D-1 SAR System Validation Summary

NOTE: While the probes have been calibrated for both CW and modulated signals, all measurements were performed using communication systems calibrated for CW signals only. Modulations in the table above represent test configurations for which the measurement system has been validated per FCC KDB Publication 865664 D01v01r04 for scenarios when CW probe calibrations are used with other signal types. SAR systems were validated for modulated signals with a periodic duty cycle, such as GMSK, or with a high peak to average ratio (>5 dB), such as OFDM according to FCC KDB Publication 865664 D01v01r04.

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APPENDIX F: DOWNLINK LTE CA RF CONDUCTED POWERS

1.1 LTE Downlink Only Carrier Aggregation Test Reduction Methodology

SAR test exclusion for LTE downlink Carrier Aggregation is determined by power measurements according to the number of component carriers (CCs) supported by the product implementation. Per April 2018 TCBC Workshop Notes, the following test reduction methodology was applied to determine the combinations required for conducted power measurements.

LTE DLCA Test Reduction Methodology:

C

- The supported combinations were arranged by the number of component carriers in columns.
- Any limitations on the PCC or SCC for each combination were identified alongside the combination (e.g. CA 2A-2A-4A-12A, but B12 can only be configured as a SCC).
- Power measurements were performed for "supersets" (LTE CA combinations with multiple components • carriers) and any "subsets" (LTE CA combinations with fewer component carriers) that were not completely covered by the supersets.
- Only subsets that have the exact same components as a superset were excluded for measurement.
- When there were certain restrictions on component carriers that existed in the superset that were not applied for the subset, the subset configuration was additionally evaluated.
- Both inter-band and intra-band downlink carrier aggregation scenarios were considered.



Table 1 – Example of Exclusion Table for SISO Configurations

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1.2 LTE Downlink Only Carrier Aggregation Test Selection and Setup

SAR test exclusion for LTE downlink Carrier Aggregation is determined by power measurements according to the number component carriers (CCs) supported by the product implementation. For those configurations required by April 2018 TCBC Workshop Notes, conducted power measurements with LTE Carrier Aggregation (CA) (downlink only) active are made in accordance to KDB Publication 941225 D05Av01r02. The RRC connection is only handled by one cell, the primary component carrier (PCC) for downlink and uplink communications. After making a data connection to the PCC, the UE device adds secondary component carrier(s) (SCC) on the downlink only. All uplink communications and acknowledgements remain identical to specifications when downlink carrier aggregation is inactive on the PCC. Additional conducted output powers are measured with the downlink carrier aggregation active for the configuration with highest measured maximum conducted power with downlink carrier aggregation inactive measured among the channel bandwidth, modulation, and RB combinations in each frequency band.

Per FCC KDB Publication 941225 D05Av01r02, no SAR measurements are required for carrier aggregation configurations when the maximum average output power with downlink only carrier aggregation active is not more than 0.25 dB higher than the average output power with downlink only carrier aggregation inactive. All bands required for SAR testing per FCC KDB procedures were considered. Based on the measured maximum powers below, no additional SAR tests were required for DLCA SAR configurations.

General PCC and SCC configuration selection procedure

- PCC uplink channel, channel bandwidth, modulation and RB configurations were selected based on section C)3)b)ii) of KDB 941225 D05 V01r02. The downlink PCC channel was paired with the selected PCC uplink channel according to normal configurations without carrier aggregation.
- To maximize aggregated bandwidth, highest channel bandwidth available for that CA combination was selected for SCC. For inter-band CA, the SCC downlink channels were selected near the middle of their transmission bands. For contiguous intra-band CA, the downlink channel spacing between the component carriers was set to multiple of 300 kHz less than the nominal channel spacing defined in section 5.4.1A of 3GPP TS 36.521. For non-contiguous intra-band CA, the downlink channel spacing between the component carriers was set to be larger than the nominal channel spacing and provided maximum separation between the component carriers.
- All selected PCC and SCC(s) remained fully within the uplink/downlink transmission band of the respective component carrier.



Figure 1 DL CA Power Measurement Setup

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1.3 Downlink Carrier Aggregation RF Conducted Powers

1.3.1 LTE Band 71 as PCC

	Table 1 Maximum Output Powers														
		PCC SCC Power													
Combination	ion PCC Band PCC BW [MHz] Channel Freq. [MHz] Modulation PCC UL# RB Offset Ch. [MHz] PCC (DL) Freq. [MHz] SCC Band SCC (DL) SCC (DL) Freq. [MHz] SCC (DL) Fr												LTE Single Carrier Tx Power (dBm)		
CA_2A-71A	LTE B71	20	133297	680.5	QPSK	1	50	68761	634.5	LTE B2	20	900	1960	24.90	25.00
CA_4A-71A	LTE B71	20	133297	680.5	QPSK	1	50	68761	634.5	LTE B4	20	2175	2132.5	24.87	25.00
CA_66A-71A	LTE B71	20	133297	680.5	QPSK	1	50	68761	634.5	LTE B66	20	66786	2145	24.82	25.00

1.3.2 LTE Band 12 as PCC

Table 2 Maximum Output Powers

					PCC						SCC			Power	
Combination	PCC Band	PCC BW [MHz]	PCC (UL) Channel	PCC (UL) Freq. [MHz]	Modulation	PCC UL# RB	PCC UL RB Offset	PCC (DL) Ch.	PCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_12A-66A (1)	LTE B12	10	23095	707.5	QPSK	1	25	5095	737.5	LTE B66	20	66786	2145	25.03	25.01
CA_12A-66A (2)	LTE B12	10	23095	707.5	QPSK	1	25	5095	737.5	LTE B66	20	66786	2145	25.03	25.01
CA_2A-12A (1)	LTE B12	10	23095	707.5	QPSK	1	25	5095	737.5	LTE B2	20	900	1960	25.04	25.01
CA_4A-12A (1)	LTE B12	10	23095	707.5	QPSK	1	25	5095	737.5	LTE B4	20	2175	2132.5	25.06	25.01
CA_4A-12A (2)	LTE B12	10	23095	707.5	QPSK	1	25	5095	737.5	LTE B4	20	2175	2132.5	25.06	25.01

1.3.3 LTE Band 13 as PCC

Table 3Maximum Output Powers

					PCC					SCC			Power		
Combination	pination PCC Band PCC BW [MHz]		PCC (UL) Channel	PCC (UL) Freq. [MHz]	Modulation	PCC UL# RB	PCC UL RB Offset	PCC (DL) Ch.	PCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_13A-66A	LTE B13	10	23230	782	QPSK	1	25	5230	751	LTE B66	20	66786	2145	25.05	25.02
CA_2A-13A	LTE B13	10	23230	782	QPSK	1	25	5230	751	LTE B2	20	900	1960	25.02	25.02
CA_4A-13A	LTE B13	10	23230	782	QPSK	1	25	5230	751	LTE B4	20	2175	2132.5	25.07	25.02

1.3.4 LTE Band 26 as PCC

Table 4 Maximum Output Powers

					PCC						SCC			Power	
Combination	PCC Band	PCC BW [MHz]	PCC (UL) Channel	PCC (UL) Freq. [MHz]	Modulation	PCC UL# RB	PCC UL RB Offset	PCC (DL) Ch.	PCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_25A-26A	LTE B26	15	26865	831.5	QPSK	1	36	8865	876.5	LTE B25	20	8365	1962.5	25.20	25.12

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1.3.5 LTE Band 66 as PCC

Table 5 Maximum Output Powers

					PCC						SCC			Power	
Combination	PCC Band	PCC BW [MHz]	PCC (UL) Channel	PCC (UL) Freq. [MHz]	Modulation	PCC UL# RB	PCC UL RB Offset	PCC (DL) Ch.	PCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_12A-66A (1)	LTE B66	3	131987	1711.5	QPSK	1	7	66451	2111.5	LTE B12	10	5095	737.5	24.70	24.70
CA_12A-66A (2)	LTE B66	5	131997	1712.5	QPSK	1	12	66461	2112.5	LTE B12	10	5095	737.5	24.65	24.68
CA_13A-66A	LTE B66	5	131997	1712.5	QPSK	1	12	66461	2112.5	LTE B13	10	5230	751	24.64	24.68
CA_2A-66A	LTE B66	5	131997	1712.5	QPSK	1	12	66461	2112.5	LTE B2	20	900	1960	24.60	24.68
CA_5A-66A	LTE B66	5	131997	1712.5	QPSK	1	12	66461	2112.5	LTE B5	10	2525	881.5	24.68	24.68
CA_66A-66A	LTE B66	5	131997	1712.5	QPSK	1	12	66461	2112.5	LTE B66	20	67236	2190	24.57	24.68
CA_66A-71A	LTE B66	5	131997	1712.5	QPSK	1	12	66461	2112.5	LTE B71	20	68761	634.5	24.70	24.68
CA_66B	LTE B66	5	131997	1712.5	QPSK	1	12	66461	2112.5	LTE B66	15	66554	2121.8	24.58	24.68
CA_66C	LTE B66	5	131997	1712.5	QPSK	1	12	66461	2112.5	LTE B66	20	66578	2124.2	24.52	24.68

1.3.6 LTE Band 25 as PCC

Table 6 **Maximum Output Powers**

					PCC						SCC			Power	
Combination	PCC Band	PCC BW [MHz]	PCC (UL) Channel	PCC (UL) Freq. [MHz]	Modulation	PCC UL# RB	PCC UL RB Offset	PCC (DL) Ch.	PCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_25A-25A (1)	LTE B25	5	26065	1852.5	QPSK	1	12	8065	1932.5	LTE B25	20	8590	1985	24.59	24.67
CA_25A-26A	LTE B25	3	26055	1851.5	QPSK	1	7	8055	1931.5	LTE B26	15	8865	876.5	24.64	24.68

1.3.7 LTE Band 41 as PCC

Table 7 **Maximum Output Powers**

					PCC						SCC			Power	
Combination	PCC Band	PCC BW [MHz]	PCC (UL) Channel	PCC (UL) Freq. [MHz]	Modulation	PCC UL# RB	PCC UL RB Offset	PCC (DL) Ch.	PCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_41A-41A (1)	LTE B41	20	41490	2680	QPSK	1	50	41490	2680	LTE B41	20	39750	2506	24.08	24.55
CA_41C (1)	LTE B41	20	41490	2680	QPSK	1	50	41490	2680	LTE B41	20	41292	2660.2	24.12	24.55

1.3.8 LTE Band 41 PC2 as PCC

Table 8 **Maximum Output Powers**

					PCC						SCC			Power	
Combination	PCC Band	PCC BW [MHz]	PCC (UL) Channel	PCC (UL) Freq. [MHz]	Modulation	PCC UL# RB	PCC UL RB Offset	PCC (DL) Ch.	PCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_41A-41A (1)	LTE B41 PC2	20	39750	2506	QPSK	1	50	39750	2506	LTE B41 PC2	20	41490	2680	27.21	27.43
CA 41C (1)	LTE B41 PC2	20	39750	2506	QPSK	1	50	39750	2506	LTE B41 PC2	20	39948	2525.8	27.13	27.43

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APPENDIX G POWER REDUCTION VERIFICATION

Per the May 2017 TCBC Workshop Notes, demonstration of proper functioning of the power reduction mechanisms is required to support the corresponding SAR configurations. The verification process was divided into two parts: (1) evaluation of output power levels for individual or multiple triggering mechanisms and (2) evaluation of the triggering distances for proximity-based sensors.

G.1 Power Verification Procedure

The power verification was performed according to the following procedure:

- 1. A base station simulator was used to establish a conducted RF connection and the output power was monitored. The power measurements were confirmed to be within expected tolerances for all states before and after a power reduction mechanism was triggered.
- 2. Step 1 was repeated for all relevant modes and frequency bands for the mechanism being investigated.
- 3. Steps 1 and 2 were repeated for all individual power reduction mechanisms and combinations thereof. For the combination cases, one mechanism was switched to a 'triggered' state at a time; powers were confirmed to be within tolerances after each additional mechanism was activated.

Mechanism(s)		Conducted F	Power (dBm)
1st	Mode/Band	Un-triggered (Max)	Mechanism #1 (Reduced)
Held-to-Ear	802.11b	22.65	20.95
Held-to-Ear	802.11a	19.11	17.46
Held-to-Ear	802.11n (5GHz, 20MHz BW)	18.77	17.42
Held-to-Ear	802.11ac (20MHz BW)	18.56	17.42

G.2 WIFI Verification Summary

Table G-1 Power Measurement Verification WIFI

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APPENDIX H: PROBEAND DIPOLE CERTIFICATIONS

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

PC Test

Client



Schweizerischer Kalibrierdienst S

- Service suisse d'étalonnage С
 - Servizio svizzero di taratura
- S Swiss Calibration Service

Accreditation No.: SCS 0108

Accredited by the Swiss Accreditation Service (SAS) The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Certificate No: D750V3-1054 Mar19/2

CALIBRATION C	ERTIECATI	E (Replacement of No:D	0750V3-1154_Mar19)
Object	D750V3 - SN:10	54	
Calibration procedure(s)	QA CAL-05.v11 Calibration Procedure for SAR Validation Sources between 0.7-3 GHz が		
Calibration date:	March 18, 2019		
This calibration certificate documer The measurements and the uncert	nts the traceability to nat ainties with confidence p	ional standards, which realize the physical (probability are given on the following pages a	units of measurements (SI). and are part of the certificate.
All calibrations have been conducte	ed in the closed laborato	ry facility: environment temperature (22 \pm 3))°C and humidity < 70%.
Calibration Equipment used (M&TE	E critical for calibration)		
Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	04-Apr-18 (No. 217-02672/02673)	Apr-19
Power sensor NRP-Z91	SN: 103244	04-Apr-18 (No. 217-02672)	Apr-19
Power sensor NRP-Z91	SN: 103245	04-Apr-18 (No. 217-02673)	Apr-19
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-18 (No. 217-02682)	Apr-19
Type-N mismatch combination	SN: 5047.2 / 06327	04-Apr-18 (No. 217-02683)	Apr-19
Reference Probe EX3DV4	SN: 7349	31-Dec-18 (No. EX3-7349_Dec18)	Dec-19
DAE4	SN: 601	04-Oct-18 (No. DAE4-601_Oct18)	Oct-19
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB39512475	07-Oct-15 (in house check Feb-19)	In house check: Oct-20
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-18)	In house check: Oct-20
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-18)	In house check: Oct-19
		Function	Signature
Calibrated by:	Manu Seitz	Laboratory Technician	<u>A</u>
Approved by:	Katja Pokovic	Technical Manager	Ally
This calibration certificate shall not	be reproduced except in	full without written approval of the laborato	Issued: April 12, 2019
		1 1	1

Calibration Laboratory of

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Schweizerischer Kalibrierdienst

S Service suisse d'étalonnage

С Servizio svizzero di taratura

S **Swiss Calibration Service**

Accredited by the Swiss Accreditation Service (SAS) The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- Measurement Conditions: Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL: The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- Feed Point Impedance and Return Loss: These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- Electrical Delay: One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- SAR measured: SAR measured at the stated antenna input power.
- SAR normalized: SAR as measured, normalized to an input power of 1 W at the antenna . connector.
- SAR for nominal TSL parameters: The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Accreditation No.: SCS 0108

Measurement Conditions

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

DASY Version	DASY5	V52.10.2
Extrapolation	Advanced Extrapolation	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5.0 mm	
Frequency	750 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.9	0.89 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	42.1 ± 6 %	0.89 mho/m ± 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	2.07 W/kg	
SAR for nominal Head TSL parameters	normalized to 1W	8.29 W/kg ± 17.0 % (k=2)	
SAR averaged over 10 cm ³ (10 g) of Head TSL	condition		
SAR averaged over 10 cm ³ (10 g) of Head TSL SAR measured	condition 250 mW input power	1.37 W/kg	

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	55.5	0.96 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	54.5 ± 6 %	0.98 mho/m ± 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	2.18 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	8.55 W/kg ± 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.44 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	5.67 W/kg ± 16.5 % (k=2)

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	54.5 Ω - 0.3 jΩ
Return Loss	- 27.2 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	50.2 Ω - 3.0 jΩ
Return Loss	- 30.3 dB

General Antenna Parameters and Design

Electrical Delevis (and alive attains)	1 005
Electrical Delay (one direction)	1 035 ns
	1.000 110

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

Appendix (Additional assessments outside the scope of SCS 0108)

Measurement Conditions

DASY system configuration, as far as not given on page 1 and 3.

antom SAM Head Phantom	For usage with cSAR3DV2-R/L

SAR result with SAM Head (Top)

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	1.93 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	7.72 W/kg ± 17.5 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.31 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	5.23 W/kg ± 16.9 % (k=2)

SAR result with SAM Head (Mouth)

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.05 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	8.20 W/kg ± 17.5 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.39 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	5.55 W/kg ± 16.9 % (k=2)

SAR result with SAM Head (Neck)

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.00 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	8.00 W/kg ± 17.5 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.38 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	5.51 W/kg ± 16.9 % (k=2)

SAR result with SAM Head (Ear)

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	1.66 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	6.64 W/kg ± 17.5 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.14 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	4.55 W/kg ± 16.9 % (k=2)

DASY5 Validation Report for Head TSL

Date: 13.03.2019

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN:1054

Communication System: UID 0 - CW; Frequency: 750 MHz Medium parameters used: f = 750 MHz; $\sigma = 0.89$ S/m; $\epsilon_r = 42.1$; $\rho = 1000$ kg/m³ Phantom section: Flat Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 SN7349; ConvF(10.32, 10.32, 10.32) @ 750 MHz; Calibrated: 31.12.2018
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.10.2018
- Phantom: Flat Phantom 4.9 (front); Type: QD 00L P49 AA; Serial: 1001
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mmReference Value = 58.96 V/m; Power Drift = 0.00 dB Peak SAR (extrapolated) = 3.06 W/kg SAR(1 g) = 2.07 W/kg; SAR(10 g) = 1.37 W/kg Maximum value of SAR (measured) = 2.73 W/kg



0 dB = 2.73 W/kg = 4.36 dBW/kg

Impedance Measurement Plot for Head TSL

<u>Elle Yi</u>	ew Channel	Sw <u>e</u> ep	Calibration	Trace <u>S</u> cale	e M <u>a</u> rker	<u>⊃y</u> stem <u>v</u>	/indow <u>H</u> e	Яр		
							750.0 50.0	100000 M 834.50 100000 M	Hz pF -2 Hz 4	54.532 Ω 254.29 mΩ 43.426 mU -3.0718 °
Ch1	Cn 1 Avg = Start 550,000 }	20 viHz							Sti	op 950.000 MHz
10.00 5.00 0.00			·			> 1	: 750.0	00000 M	Hz -	-27.245 dB
-3.00 -10.00 -20.00 -25.00 -30.00 -35.00 -40.00 Ch1	Ch 1 Avg = : Start 550,000 ł	20 MHz							 	op 950.000 MHz

DASY5 Validation Report for Body TSL

Date: 13.03.2019

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN:1054

Communication System: UID 0 - CW; Frequency: 750 MHz Medium parameters used: f = 750 MHz; σ = 0.98 S/m; ϵ_r = 54.5; ρ = 1000 kg/m³ Phantom section: Flat Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 SN7349; ConvF(10.29, 10.29, 10.29) @ 750 MHz; Calibrated: 31.12.2018
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.10.2018
- Phantom: Flat Phantom 4.9 (Back); Type: QD 00R P49 AA; Serial: 1005
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mmReference Value = 57.37 V/m; Power Drift = -0.01 dB Peak SAR (extrapolated) = 3.19 W/kg SAR(1 g) = 2.18 W/kg; SAR(10 g) = 1.44 W/kg Maximum value of SAR (measured) = 2.87 W/kg



0 dB = 2.87 W/kg = 4.58 dBW/kg

Impedance Measurement Plot for Body TSL

File	View	Channel	Sw <u>e</u> ep	Calibration	<u>T</u> race <u>S</u> cale	M <u>a</u> rker	S <u>y</u> stem	<u>W</u> indow <u>H</u> e	alp		
								: 750.0 2 750.0	00000 M 69.776 00000 M	Hz pF Hz (50.211 Ω -3.0413 Ω 30.407 mU -84.301 °
	Ch1: St	Ch 1 Avg = art 550,000 i	20 viHz	XXIII.0.3						St	op 950.000 MHz
10, 5,0 0,0 -5,0 -10	00 10 10 10 10							: 750.0	00000 M	Hz -	-30.340 dB
-15 -20 -25 -30 -35 -40	.00 .00 .00 .00 .00 Ch1: St	Ch 1 Avg = art 550,000	20 120 142							St	op 950.000 MHz

DASY5 Validation Report for SAM Head

Date: 18.03.2019

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN:1054

Communication System: UID 0 - CW; Frequency: 750 MHz Medium parameters used: f = 750 MHz; σ = 0.904 S/m; ε_r = 44.22; ρ = 1000 kg/m³ Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 SN7349; ConvF(10.32, 10.32, 10.32) @ 750 MHz; Calibrated: 31.12.2018
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.10.2018
- Phantom: SAM Head
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

SAM Right/Head/Top/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 55.66 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 2.80 W/kgSAR(1 g) = 1.93 W/kg; SAR(10 g) = 1.31 W/kgMaximum value of SAR (measured) = 2.52 W/kg

SAM Right/Head/Mouth/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm,

dz=5mm Reference Value = 57.68 V/m; Power Drift = 0.03 dB Peak SAR (extrapolated) = 2.98 W/kg SAR(1 g) = 2.05 W/kg; SAR(10 g) = 1.39 W/kg Maximum value of SAR (measured) = 2.68 W/kg

SAM Right/Head/Neck/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 56.23 V/m; Power Drift = -0.04 dB Peak SAR (extrapolated) = 2.82 W/kg SAR(1 g) = 2 W/kg; SAR(10 g) = 1.38 W/kg Maximum value of SAR (measured) = 2.56 W/kg

SAM Right/Head/Ear/Zoom Scan (8x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 50.76 V/m; Power Drift = -0.02 dB Peak SAR (extrapolated) = 2.32 W/kg SAR(1 g) = 1.66 W/kg; SAR(10 g) = 1.14 W/kg Maximum value of SAR (measured) = 2.11 W/kg



0 dB = 2.11 W/kg = 3.24 dBW/kg

Calibration Laboratory of

Schmid & Partner Engineering AG Zeughausstrasse 43, 8004 Zurich, Switzerland



Schweizerischer Kalibrierdienst Service suisse d'étalonnage Servizio svizzero di taratura Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS) The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Certificate No: D835V2-4d133_Oct18

Accreditation No.: SCS 0108

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PC Test

Client

GALAIBBAANIONEG	E HIE CALE	i	
Object	D835V2 - SN:4d1	133	
Calibration procedure(s)	QA CAL-05:v10 Calibration proce	dure for dipole validation kits abo	ve 700 MHz BN
Callbration date:	October 19, 2018)	10/30/2018 BN 10-20-2010
This calibration certificate documer The measurements and the uncerta	ns the traceability to nati ainties with confidence p	onal standards, which realize the physical uni robability are given on the following pages an	its of measurements (SI). d'are part of the certificate.
All calibrations have been conducts Calibration Equipment used (M&TE	ed in the closed laborator E critical for calibration)	ry facility: environment temperature (22 ± 3)°C	C and humidity < 70%.
Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NBP	SN: 104778	04-Apr-18 (No. 217-02672/02673)	Anr-19
Power sensor NBP-791	SN: 103244	04-Apr-18 (No. 217-02672)	Apr-19
Power sensor NBP-791	SN: 103245	04-Apr-18 (No. 217-02673)	Apr-19
Beference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-18 (No. 217-02682)	Apr-19
Type-N mismatch combination	SN: 5047.2 / 06327	04-Apr-18 (No. 217-02683)	Apr-19
Reference Probe EX3DV4	SN: 7349	30-Dec-17 (No. EX3-7349 Dec17)	Dec-18
DAE4	SN: 601	04-Oct-18 (No. DAE4-601_Oct18)	Oct-19
Secondary Standards	ID #	Check Date (In house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-18)	In house check: Oct-20
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-18)	In house check: Oct-19
Calibrated by:	Name Manu Seitz	Function Laboratory Technician	Signature
Approved by:	Katja Pokovic	Cechnical Manager	een EUG
This calibration certificate shall not	be reproduced except Ir	full without written approval of the laboratory	Issued: October 22, 2018

Calibration Laboratory of

Schmid & Partner Engineering AG Zeughausstrasse 43, 8004 Zurich, Switzerland





S Schweizerischer Kalibrierdienst

- C Service suisse d'étalonnage
- Servizio svizzero di taratura
- S Swiss Calibration Service

Accreditation No.: SCS 0108

Accredited by the Swiss Accreditation Service (SAS) The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL: The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- Feed Point Impedance and Return Loss: These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- SAR measured: SAR measured at the stated antenna input power.
- SAR normalized: SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters: The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Measurement Conditions

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

DASY Version	DASY5	V52.10.2
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.6 ± 6 %	0.91 mho/m ± 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	2.39 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	9.43 W/kg ± 17.0 % (k=2)
	· · · ·	· · · · · · · · · · · · · · · · · · ·
SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.54 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	6.10 W/kg ± 16.5 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	55.2	0.97 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	54.9 ± 6 %	0.98 mho/m ± 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	2.46 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	9.75 W/kg ± 17.0 % (k=2)

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.61 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	6.40 W/kg ± 16.5 % (k=2)

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	50.6 Ω - 2.4 jΩ
Return Loss	- 32.2 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	45.0 Ω - 6.7 jΩ
Return Loss	- 21.1 dB

General Antenna Parameters and Design

	Electrical Delay (one direction)	1.397 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	July 22, 2011

DASY5 Validation Report for Head TSL

Date: 19.10.2018

Test Laboratory: The name of your organization

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d133

Communication System: UID 0 - CW; Frequency: 835 MHz Medium parameters used: f = 835 MHz; $\sigma = 0.91$ S/m; $\varepsilon_r = 40.6$; $\rho = 1000$ kg/m³ Phantom section: Flat Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 SN7349; ConvF(9.9, 9.9, 9.9) @ 835 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.10.2018
- Phantom: Flat Phantom 4.9 (front); Type: QD 00L P49 AA; Serial: 1001
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mmReference Value = 63.02 V/m; Power Drift = -0.02 dB Peak SAR (extrapolated) = 3.68 W/kg SAR(1 g) = 2.39 W/kg; SAR(10 g) = 1.54 W/kg Maximum value of SAR (measured) = 3.24 W/kg



0 dB = 3.24 W/kg = 5.11 dBW/kg

Impedance Measurement Plot for Head TSL

File	⊻jew	Channel	Sw <u>e</u> ep	Calibration	<u>T</u> race <u>S</u> cale	M <u>a</u> rker	S <u>y</u> stem	Window He	яþ			
					A			1: 835.0 2 835.0	000000 M 79.672 000000 M	Hz pF Hz	50 -2. 24.4 -7	1.571 Ω 3924 Ω 148 mU 5.225 °
	Ch1;St	Ch 1 Avg = art 635,000 (20 MHz			·····					Stop 1	.03500 GHz
50, 40, 30, 10, -10, -20, -30, -30, -50, -50,	00 00 00 00 00 00 00 00 0.00 0.00 0.00	Ch 1 Awg = art 635.000	20 MHz					1: 835.0		Hz	-32	235 dB
St	alus	CH 1:	S11		C* 1-Port		Avg=20) Delay				LCL

DASY5 Validation Report for Body TSL

Date: 19.10.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d133

Communication System: UID 0 - CW; Frequency: 835 MHz Medium parameters used: f = 835 MHz; $\sigma = 0.98$ S/m; $\epsilon_r = 54.9$; $\rho = 1000$ kg/m³ Phantom section: Flat Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 SN7349; ConvF(10.05, 10.05, 10.05) @ 835 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.10.2018
- Phantom: Flat Phantom 4.9 (Back); Type: QD 00R P49 AA; Serial: 1005
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mmReference Value = 61.61 V/m; Power Drift = -0.02 dB Peak SAR (extrapolated) = 3.69 W/kg SAR(1 g) = 2.46 W/kg; SAR(10 g) = 1.61 W/kg Maximum value of SAR (measured) = 3.28 W/kg



0 dB = 3.28 W/kg = 5.16 dBW/kg

Impedance Measurement Plot for Body TSL





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Certification of Calibration

Object

D835V2 – SN:4d133

Calibration procedure(s) Procedure for Calibration Extension for SAR Dipoles.

Extended Calibration date: October 18, 2019

Description: S

SAR Validation Dipole at 835 MHz.

Calibration Equipment used:

Manufacturer	Model	Description		Cal Interval	Cal Due	Serial Number
Control Company	4040	Therm./Clock/Humidity Monitor	6/29/2019	Biennial	6/29/2021	192291470
Control Company	4352	Ultra Long Stem Thermometer	8/2/2018	Biennial	8/2/2020	181334684
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	433971
Narda	4772-3	Attenuator (3dB)	CBT	N/A	CBT	9406
Keysight Technologies	85033E	Standard Mechanical Calibration Kit (DC to 9GHz, 3.5mm)	7/2/2019	Annual	7/2/2020	MY53401181
Rohde & Schwarz	ZNLE6	Vector Network Analyzer	10/11/2019	Annual	10/11/2020	101307
Mini-Circuits	BW-N20W5+	DC to 18 GHz Precision Fixed 20 dB Attenuator	CBT	N/A	CBT	N/A
SPEAG	DAKS-3.5	Portable Dielectric Assessment Kit	8/13/2019	Annual	8/13/2020	1041
Anritsu	MA2411B	Pulse Power Sensor	8/14/2019	Annual	8/14/2020	1315051
Anritsu	MA2411B	Pulse Power Sensor	8/8/2019	Annual	8/8/2020	1339008
Anritsu	ML2495A	Power Meter	11/20/2018	Annual	11/20/2019	1039008
Agilent	N5182A	MXG Vector Signal Generator	8/19/2019	Annual	8/19/2020	MY47420837
Seekonk	NC-100	Torque Wrench	5/9/2018	Biennial	5/9/2020	22217
Mini-Circuits	NLP-2950+	Low Pass Filter DC to 2700 MHz	CBT	N/A	CBT	N/A
MiniCircuits	ZHDC-16-63-S+	Bidirectional Coupler	CBT	N/A	CBT	N/A
MiniCircuits	VLF-6000+	Low Pass Filter	CBT	N/A	CBT	N/A
SPEAG	EX3DV4	SAR Probe	9/19/2019	Annual	9/19/2020	7551
SPEAG	EX3DV4	SAR Probe	4/24/2019	Annual	4/24/2020	7357
SPEAG	DAE4	Dasy Data Acquisition Electronics	9/17/2019	Annual	9/17/2020	1333
SPEAG	DAE4	Dasy Data Acquisition Electronics	4/18/2019	Annual	4/18/2020	1407

Note: CBT (Calibrated Before Testing). Prior to testing, the measurement paths containing a cable, amplifier, attenuator, coupler or filter were connected to a calibrated source (i.e. a signal generator) to determine the losses of the measurement path.

Measurement Uncertainty = $\pm 23\%$ (k=2)

	Name	Function	Signature
Calibrated By:	Brodie Halbfoster	Team Lead Engineer	BRODIE HALBFOSTER
Approved By:	Kaitlin O'Keefe	Senior Technical Manager	XOK

Object:	Date Issued:	Dogo 1 of 4
D835V2 – SN:4d133	10/18/2019	Fage 1 014

DIPOLE CALIBRATION EXTENSION

Per KDB 865664 D01, calibration intervals of up to three years may be considered for reference dipoles when it is demonstrated that the SAR target, impedance and return loss of a dipole have remained stable according to the following requirements:

- 1. The measured SAR does not deviate more than 10% from the target on the calibration certificate.
- 2. The return-loss does not deviate more than 20% from the previous measurement and meets the required 20dB minimum return-loss requirement.
- 3. The measurement of real or imaginary parts of impedance does not deviate more than 5Ω from the previous measurement.

The following dipole was checked to pass the above 3 requirements to have 2-year calibration period from the calibration date:

Calibration Date	Extension Date	Certificate Electrical Delay (ns)	Certificate SAR Target Head (1g) W/kg @ 23.0 dBm	Measured Head SAR (1g) W/kg @ 23.0 dBm	Deviation 1g (%)	Certificate SAR Target Head (10g) W/kg @ 23.0 dBm	Measured Head SAR (10g) W/kg @ 23.0 dBm	Deviation 10g (%)	Certificate Impedance Head (Ohm) Real	Measured Impedance Head (Ohm) Real	Difference (Ohm) Real	Certificate Impedance Head (Ohm) Imaginary	Measured Impedance Head (Ohm) Imaginary	Difference (Ohm) Imaginary	Certificate Return Loss Head (dB)	Measured Return Loss Head (dB)	Deviation (%)	PASS/FAIL
10/19/2018	10/18/2019	1.397	1.886	2.03	7.64%	1.22	1.32	8.20%	50.6	49.5	1.1	-2.4	-3.2	0.8	-32.2	-29.8	7.50%	PASS
			Certificate	Management		Certificate												
Calibration Date	Extension Date	Certificate Electrical Delay (ns)	SAR Target Body (1g) W/kg @ 23.0 dBm	Body SAR (1g) W/kg @ 23.0 dBm	Deviation 1g (%)	SAR Target Body (10g) W/kg @ 23.0 dBm	Measured Body SAR (10g) W/kg @ 23.0 dBm	Deviation 10g (%)	Certificate Impedance Body (Ohm) Real	Measured Impedance Body (Ohm) Real	Difference (Ohm) Real	Certificate Impedance Body (Ohm) Imaginary	Measured Impedance Body (Ohm) Imaginary	Difference (Ohm) Imaginary	Certificate Return Loss Body (dB)	Measured Return Loss Body (dB)	Deviation (%)	PASS/FAIL

Object:	Date Issued:	Daga 2 of 4
D835V2 – SN:4d133	10/18/2019	Fage 2 014

Impedance & Return-Loss Measurement Plot for Head TSL



15:29:41 18.10.2019

Object:	Date Issued:	Daga 2 of 4
D835V2 – SN:4d133	10/18/2019	raye 5 01 4

Impedance & Return-Loss Measurement Plot for Body TSL



15:30:43 18.10.2019

Object:	Date Issued:	Dago 4 of 4
D835V2 – SN:4d133	10/18/2019	Fage 4 01 4

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

Client

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Certificate No: D1750V2-1150_Oct18

Accreditation No.: SCS 0108

ALIBRAT	ION CERT	<i>IIFICATE</i>

PC Test

Object	D1750V2 SN 11	50	an al an
Calibration procedure(s)	QA CAL-05.v10 Calibration proce	dure for dipole validation kits above 7	'00 MHz
Calibration date:	October 22, 2018		BN1- 1013012018
This calibration certificate documer The measurements and the uncerta	its the traceability to nati ainties with confidence p	onal standards, which realize the physical units of robability are given on the following pages and are	10-20-2019 measurements (SI). part of the certificate.
Calibration Equipment used (M&TE	eritical for calibration)	y racing, environment temperature (22 \pm 3) C and	Пиплику < 70%.
Primary Standards	1D#	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	04-Apr-18 (No. 217-02672/02673)	Apr-19
Power sensor NRP-Z91	SN: 103244	04-Apr-18 (No. 217-02672)	Apr-19
Power sensor NRP-Z91	SN: 103245	04-Apr-18 (No. 217-02673)	Apr-19
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-18 (No. 217-02682)	Apr-19
Type-N mismatch combination	SN: 5047.2 / 06327	04-Apr-18 (No. 217-02683)	Apr-19
Reference Probe EX3DV4	SN: 7349	30-Dec-17 (No. EX3-7349 Dec17)	DEC-18
DAE4	SN: 601	04-Oct-18 (No. DAE4-601_Oct18)	Oct-19
Secondary Standards	D#	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-18)	In house check: Oct-20
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-18)	In house check: Oct-19
Calibrated by:	Name Michael Weber	Function Laboratory Technician	signature N.W.L.S.
Approved by:	Katja Pokovic	Technical Manager	EU E
This calibration certificate shall not	be reproduced except in	full without written approval of the laboratory.	Issued: October 22, 2018

Certificate No: D1750V2-1150_Oct18

Calibration Laboratory of

Schmid & Partner **Engineering AG** Zeughausstrasse 43, 8004 Zurich, Switzerland





Schweizerischer Kalibrierdienst

- S Service suisse d'étalonnage С
 - Servizio svizzero di taratura
- S Swiss Calibration Service

Accreditation No.: SCS 0108

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Glossarv:

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

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- Measurement Conditions: Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL: The dipole is mounted with the spacer to position its feed • point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- Feed Point Impedance and Return Loss: These parameters are measured with the dipole • positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- Electrical Delay: One-way delay between the SMA connector and the antenna feed point. ٠ No uncertainty required.
- SAR measured: SAR measured at the stated antenna input power.
- SAR normalized: SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters: The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Measurement Conditions

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

DASY Version	DASY5	V52.10.2
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1750 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.1	1.37 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	38.8 ± 6 %	1.33 mho/m ± 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	9.02 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	36.5 W/kg ± 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	4.76 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	19.2 W/kg ± 16.5 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	53.4	1.49 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	53.5±6%	1.46 mho/m ± 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	9.04 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	36.6 W/kg ± 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	4.82 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	19.4 W/kg ± 16.5 % (k=2)
Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	50.9 Ω - 0.4 jΩ
Return Loss	- 40.1 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	46.6 Ω - 0.1 jΩ
Return Loss	- 29.2 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.217 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
Manufactured on	April 10, 2015

DASY5 Validation Report for Head TSL

Date: 22.10.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN:1150

Communication System: UID 0 - CW; Frequency: 1750 MHz Medium parameters used: f = 1750 MHz; $\sigma = 1.33$ S/m; $\epsilon_r = 38.8$; $\rho = 1000$ kg/m³ Phantom section: Flat Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 SN7349; ConvF(8.5, 8.5, 8.5) @ 1750 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electromics: DAE4 Sn601; Calibrated: 04.10.2018
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

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

Measurement grid: dx=5mm, dy=5mm, dz=5mmReference Value = 108.1 V/m; Power Drift = -0.09 dB Peak SAR (extrapolated) = 16.7 W/kg SAR(1 g) = 9.02 W/kg; SAR(10 g) = 4.76 W/kg Maximum value of SAR (measured) = 14.0 W/kg



Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 22.10.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN:1150

Communication System: UID 0 - CW; Frequency: 1750 MHz Medium parameters used: f = 1750 MHz; σ = 1.46 S/m; ϵ_r = 53.5; ρ = 1000 kg/m³ Phantom section: Flat Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 SN7349; ConvF(8.35, 8.35, 8.35) @ 1750 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.10.2018
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

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

Measurement grid: dx=5mm, dy=5mm, dz=5mmReference Value = 102.1 V/m; Power Drift = -0.09 dB Peak SAR (extrapolated) = 16.0 W/kg SAR(1 g) = 9.04 W/kg; SAR(10 g) = 4.82 W/kg Maximum value of SAR (measured) = 13.6 W/kg



0 dB = 13.6 W/kg = 11.34 dBW/kg

Impedance Measurement Plot for Body TSL





PCTEST ENGINEERING LABORATORY, INC. 7185 Oakland Mills Road, Columbia, MD 21046 USA Tel. +1.410.290.6652 / Fax +1.410.290.6654

http://www.pctest.com



Certification of Calibration

Object

D1750V2 - SN:1150

Calibration procedure(s) Procedure for Calibration Extension for SAR Dipoles.

October 18, 2019

Extended Calibration date:

Description:

SAR Validation Dipole at 1750 MHz.

Calibration Equipment used:

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Control Company	4040	Therm./Clock/Humidity Monitor	6/29/2019	Biennial	6/29/2021	192291470
Control Company	4352	Ultra Long Stem Thermometer	8/2/2018	Biennial	8/2/2020	181334684
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	433971
Narda	4772-3	Attenuator (3dB)	CBT	N/A	CBT	9406
Keysight Technologies	85033E	Standard Mechanical Calibration Kit (DC to 9GHz, 3.5mm)	7/2/2019	Annual	7/2/2020	MY53401181
Rohde & Schwarz	ZNLE6	Vector Network Analyzer	10/11/2019	Annual	10/11/2020	101307
Mini-Circuits	BW-N20W5+	DC to 18 GHz Precision Fixed 20 dB Attenuator	CBT	N/A	CBT	N/A
SPEAG	DAKS-3.5	Portable Dielectric Assessment Kit	8/13/2019	Annual	8/13/2020	1041
Anritsu	MA2411B	Pulse Power Sensor	8/14/2019	Annual	8/14/2020	1315051
Anritsu	MA2411B	Pulse Power Sensor	8/8/2019	Annual	8/8/2020	1339008
Anritsu	ML2495A	Power Meter	11/20/2018	Annual	11/20/2019	1039008
Agilent	N5182A	MXG Vector Signal Generator	8/19/2019	Annual	8/19/2020	MY47420837
Seekonk	NC-100	Torque Wrench	5/9/2018	Biennial	5/9/2020	22217
Mini-Circuits	NLP-2950+	Low Pass Filter DC to 2700 MHz	CBT	N/A	CBT	N/A
MiniCircuits	ZHDC-16-63-S+	Bidirectional Coupler	CBT	N/A	CBT	N/A
MiniCircuits	VLF-6000+	Low Pass Filter	CBT	N/A	CBT	N/A
SPEAG	EX3DV4	SAR Probe	8/16/2019	Annual	8/16/2020	7308
SPEAG	EX3DV4	SAR Probe	4/24/2019	Annual	4/24/2020	7357
SPEAG	DAE4	Dasy Data Acquisition Electronics	4/18/2019	Annual	4/18/2020	1407
SPEAG	DAE4	Dasy Data Acquisition Electronics	8/14/2019	Annual	8/14/2020	1450

Note: CBT (Calibrated Before Testing). Prior to testing, the measurement paths containing a cable, amplifier, attenuator, coupler or filter were connected to a calibrated source (i.e. a signal generator) to determine the losses of the measurement path.

Measurement Uncertainty = $\pm 23\%$ (k=2)

	Name	Function	Signature
Calibrated By:	Brodie Halbfoster	Team Lead Engineer	BRODIE HALBFOSTER
Approved By:	Kaitlin O'Keefe	Senior Technical Manager	ROK

Object:	Date Issued:	Daga 1 of 4
D1750V2 – SN:1150	10/18/2019	raye 1014

DIPOLE CALIBRATION EXTENSION

Per KDB 865664 D01, calibration intervals of up to three years may be considered for reference dipoles when it is demonstrated that the SAR target, impedance and return loss of a dipole have remained stable according to the following requirements:

- 1. The measured SAR does not deviate more than 10% from the target on the calibration certificate.
- 2. The return-loss does not deviate more than 20% from the previous measurement and meets the required 20dB minimum return-loss requirement.
- 3. The measurement of real or imaginary parts of impedance does not deviate more than 5Ω from the previous measurement.

The following dipole was checked to pass the above 3 requirements to have 2-year calibration period from the calibration date:

Calibration Date	Extension Date	Certificate Electrical Delay (ns)	Certificate SAR Target Head (1g) W/kg @ 20.0 dBm	Measured Head SAR (1g) W/kg @ 20.0 dBm	Deviation 1g (%)	Certificate SAR Target Head (10g) W/kg @ 20.0 dBm	Measured Head SAR (10g) W/kg @ 20.0 dBm	Deviation 10g (%)	Certificate Impedance Head (Ohm) Real	Measured Impedance Head (Ohm) Real	Difference (Ohm) Real	Certificate Impedance Head (Ohm) Imaginary	Measured Impedance Head (Ohm) Imaginary	Difference (Ohm) Imaginary	Certificate Return Loss Head (dB)	Measured Return Loss Head (dB)	Deviation (%)	PASS/FAIL
10/22/2018	10/18/2019	1.217	3.65	3.8	4.11%	1.92	2	4.17%	50.9	49.3	1.6	0.4	-0.7	1.1	-40.1	-40.2	-0.20%	PASS
Calibration Date	Extension Date	Certificate Electrical Delay (ns)	Certificate SAR Target Body (1g) W/kg @ 20.0 dBm	Measured Body SAR (1g) W/kg @ 20.0 dBm	Deviation 1g (%)	Certificate SAR Target Body (10g) W/kg @ 20.0 dBm	Measured Body SAR (10g) W/kg @ 20.0 dBm	Deviation 10g (%)	Certificate Impedance Body (Ohm) Real	Measured Impedance Body (Ohm) Real	Difference (Ohm) Real	Certificate Impedance Body (Ohm) Imaginary	Measured Impedance Body (Ohm) Imaginary	Difference (Ohm) Imaginary	Certificate Return Loss Body (dB)	Measured Return Loss Body (dB)	Deviation (%)	PASS/FAIL
10/22/2018	10/18/2019	1.217	3.66	3.82	4.37%	1.94	2.02	4.12%	46.6	44.7	1.9	-0.1	-0.8	0.7	-29.2	-25	14.40%	PASS

Object:	Date Issued:	Page 2 of 4
D1750V2 – SN:1150	10/18/2019	Faye 2 01 4

Impedance & Return-Loss Measurement Plot for Head TSL



15:15:52 18.10.2019

Object:	Date Issued:	Page 3 of 4
D1750V2 – SN:1150	10/18/2019	Fage 5 01 4

Impedance & Return-Loss Measurement Plot for Body TSL



15:19:09 18.10.2019

Object:	Date Issued:	Page 4 of 4
D1750V2 – SN:1150	10/18/2019	Fage 4 01 4

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



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Accreditation No.: S	SCS 01	08
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Certificate No: D1900V2-5d080_Oct18

Client PC Test

	D1900V2 - SN:50	080	
alibration procedure(s)	QA CAL-05.v10 Calibration proce	dure for dipole validation kits abo	ve 700 MHz
			BN
alibration date:	October 23, 2018		10-30-2018
This calibration certificate documen The measurements and the uncerta All calibrations have been conducte Calibration Equipment used (M&TE	its the traceability to nati aintles with confidence p ed in the closed laborato critical for calibration)	onal standards, which realize the physical uni robability are given on the following pages an ry facility: environment temperature (22 ± 3)°C	Its of measurements (SI). 10-20-20-20-20-20-20-20-20-20-20-20-20-20
Primary Standards	D#	Cal Date (Certificate No.)	Scheduled Calibration
ower meter NRP	SN: 104778	04-Apr-18 (No. 217-02672/02673)	Apr-19
ower sensor NRP-Z91	SN: 103244	04-Apr-18 (No. 217-02672)	Apr-19
ower sensor NRP-Z91	S N: 103245	04-Apr-18 (No. 217-02673)	Apr-19
leference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-18 (No. 217-02682)	Apr-19
vpe-N mismatch combination	SN: 5047.2 / 06327	04-Apr-18 (No. 217-02683)	Apr-19
eference Probe EX3DV4	SN: 7349	30-Dec-17 (No. EX3-7349_Dec17)	Dec-18
AE4	SN: 601	04-0ct-18 (No. DAE4-601_0ct18)	Oct-19
AE4	SN: 601 ID #	04-Oct-18 (No. DAE4-601_Oct18) Check Date (in house)	Oct-19 Scheduled Check
AE4 Secondary Standards	SN: 601	04-Oct-18 (No. DAE4-601_Oct18) Check Date (in house) 07-Oct-15 (in house check Oct-18)	Oct-19 Scheduled Check In house check: Oct-20
econdary Standards wer meter EPM-442A ower sensor HP 8481A	SN: 601 ID # SN: GB37480704 SN: US37292783	04-Oct-18 (No. DAE4-601_Oct18) Check Date (in house) 07-Oct-15 (in house check Oct-18) 07-Oct-15 (in house check Oct-18)	Oct-19 Scheduled Check In house check: Oct-20 In house check: Oct-20
PAE4 Secondary Standards Power meter EPM-442A Power sensor HP 8481A Power sensor HP 8481A	SN: 601 ID # SN: GB37480704 SN: US37292783 SN: MY41092317	04-Oct-18 (No. DAE4-601_Oct18) Check Date (in house) 07-Oct-15 (in house check Oct-18) 07-Oct-15 (in house check Oct-18) 07-Oct-15 (in house check Oct-18)	Oct-19 Scheduled Check In house check: Oct-20 In house check: Oct-20 In house check: Oct-20
DAE4 Secondary Standards Power meter EPM-442A Power sensor HP 8481A Power sensor HP 8481A RF generator R&S SMT-06	SN: 601 ID # SN: GB37480704 SN: US37292783 SN: MY41092317 SN: 100972	04-Oct-18 (No. DAE4-601_Oct18) Check Date (in house) 07-Oct-15 (in house check Oct-18) 07-Oct-15 (in house check Oct-18) 07-Oct-15 (in house check Oct-18) 15-Jun-15 (in house check Oct-18)	Oct-19 Scheduled Check In house check: Oct-20 In house check: Oct-20 In house check: Oct-20 In house check: Oct-20
DAE4 Secondary Standards Power meter EPM-442A Power sensor HP 8481A Power sensor HP 8481A RF generator R&S SMT-06 Network Analyzer Agilent E8358A	SN: 601 ID # SN: GB37480704 SN: US37292783 SN: MY41092317 SN: 100972 SN: US41080477	Check Date (in house) 07-Oct-15 (in house check Oct-18) 07-Oct-15 (in house check Oct-18) 07-Oct-15 (in house check Oct-18) 07-Oct-15 (in house check Oct-18) 15-Jun-15 (in house check Oct-18) 31-Mar-14 (in house check Oct-18)	Oct-19 Scheduled Check In house check: Oct-20 In house check: Oct-20 In house check: Oct-20 In house check: Oct-20 In house check: Oct-19
DAE4 Secondary Standards Power meter EPM-442A Power sensor HP 8481A Power sensor HP 8481A RF generator R&S SMT-06 Network Analyzer Agilent E8358A	SN: 601 ID # SN: GB37480704 SN: US37292783 SN: MY41092317 SN: 100972 SN: US41080477 Name	Check Date (in house) 07-Oct-15 (in house check Oct-18) 07-Oct-15 (in house check Oct-18) 07-Oct-15 (in house check Oct-18) 15-Jun-15 (in house check Oct-18) 31-Mar-14 (in house check Oct-18) Function	Oct-19 Scheduled Check In house check: Oct-20 In house check: Oct-20 In house check: Oct-20 In house check: Oct-20 In house check: Oct-19 Signature
DAE4 <u>Secondary Standards</u> Power meter EPM-442A Power sensor HP 8481A Power sensor HP 8481A RF generator R&S SMT-06 Jetwork Analyzer Agilent E8358A Calibrated by:	SN: 601 ID # SN: GB37480704 SN: US37292783 SN: MY41092317 SN: 100972 SN: US41080477 Name Jeton Kastrati	Check Date (in house) 07-Oct-15 (in house check Oct-18) 07-Oct-15 (in house check Oct-18) 07-Oct-15 (in house check Oct-18) 15-Jun-15 (in house check Oct-18) 31-Mar-14 (in house check Oct-18) Function	Oct-19 <u>Scheduled Check</u> In house check: Oct-20 In house check: Oct-20 In house check: Oct-20 In house check: Oct-20 In house check: Oct-19 Signature UUU
AE4 <u>econdary Standards</u> ower meter EPM-442A ower sensor HP 8481A ower sensor HP 8481A IF generator R&S SMT-06 letwork Analyzer Agilent E8358A calibrated by: .pproved by:	SN: 601 ID # SN: GB37480704 SN: US37292783 SN: MY41092317 SN: 100972 SN: US41080477 Name Jeton Kastratl Katja Pokovic	Check Date (in house) 07-Oct-15 (in house check Oct-18) 07-Oct-15 (in house check Oct-18) 07-Oct-15 (in house check Oct-18) 15-Jun-15 (in house check Oct-18) 31-Mar-14 (in house check Oct-18) Function Laboratory Technician	Oct-19 <u>Scheduled Check</u> In house check: Oct-20 In house check: Oct-20 In house check: Oct-20 In house check: Oct-20 In house check: Oct-19 Signature Signature

Calibration Laboratory of

Schmid & Partner Engineering AG Zeughausstrasse 43, 8004 Zurich, Switzerland





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Glossary:

Tel	tiesus simulating liquid
	lissue simulating inquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

e) DASY4/5 System Handbook

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- 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%.

Accreditation No.: SCS 0108

Measurement Conditions

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

DASY Version	DASY5	V52.10.2
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1900 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.3 ± 6 %	1.40 mho/m ± 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	9.93 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	39.8 W/kg ± 17.0 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.18 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	20.7 W/kg ± 16.5 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	52.9 ± 6 %	1.47 mho/m ± 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	9.62 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	39.2 W/kg ± 17.0 % (k=2)

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.09 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	20.6 W/kg ± 16.5 % (k=2)

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.5 Ω + 7.9 jΩ
Return Loss	- 21.8 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	48.1 Ω + 8.1 jΩ
Return Loss	- 21.5 dB

General Antenna Parameters and Design

Electrical Delay (one directio	n)	1.193 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
Manufactured on	June 28, 2006

DASY5 Validation Report for Head TSL

Date: 23.10.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d080

Communication System: UID 0 - CW; Frequency: 1900 MHz Medium parameters used: f = 1900 MHz; $\sigma = 1.4$ S/m; $\varepsilon_r = 40.3$; $\rho = 1000$ kg/m³ Phantom section: Flat Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 SN7349; ConvF(8.18, 8.18, 8.18) @ 1900 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.10.2018
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

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

Measurement grid: dx=5mm, dy=5mm, dz=5mmReference Value = 110.0 V/m; Power Drift = -0.05 dB Peak SAR (extrapolated) = 18.7 W/kg SAR(1 g) = 9.93 W/kg; SAR(10 g) = 5.18 W/kg Maximum value of SAR (measured) = 15.6 W/kg



0 dB = 15.6 W/kg = 11.93 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 23.10.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d080

Communication System: UID 0 - CW; Frequency: 1900 MHz Medium parameters used: f = 1900 MHz; σ = 1.47 S/m; ϵ_r = 52.9; ρ = 1000 kg/m³ Phantom section: Flat Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 SN7349; ConvF(8.15, 8.15, 8.15) @ 1900 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.10.2018
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

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 = 99.86 V/m; Power Drift = 0.00 dB Peak SAR (extrapolated) = 17.3 W/kg SAR(1 g) = 9.62 W/kg; SAR(10 g) = 5.09 W/kg Maximum value of SAR (measured) = 14.1 W/kg



0 dB = 14.1 W/kg = 11.49 dBW/kg





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http://www.pctest.com



Certification of Calibration

Object

D1900V2 - SN:5d080

Calibration procedure(s) Procedure for Calibration Extension for SAR Dipoles.

October 18, 2019

Extended Calibration date:

Description:

SAR Validation Dipole at 1900 MHz.

Calibration Equipment used:

Manufacturer	Model	Description		Cal Interval	Cal Due	Serial Number
Control Company	4040	Therm./Clock/Humidity Monitor	6/29/2019	Biennial	6/29/2021	192291470
Control Company	4352	Ultra Long Stem Thermometer	8/2/2018	Biennial	8/2/2020	181334684
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	433971
Narda	4772-3	Attenuator (3dB)	CBT	N/A	CBT	9406
Keysight Technologies	85033E	Standard Mechanical Calibration Kit (DC to 9GHz, 3.5mm)	7/2/2019	Annual	7/2/2020	MY53401181
Rohde & Schwarz	ZNLE6	Vector Network Analyzer	10/11/2019	Annual	10/11/2020	101307
Mini-Circuits	BW-N20W5+	DC to 18 GHz Precision Fixed 20 dB Attenuator	CBT	N/A	CBT	N/A
SPEAG	DAKS-3.5	Portable Dielectric Assessment Kit	8/13/2019	Annual	8/13/2020	1041
Anritsu	MA2411B	Pulse Power Sensor	8/14/2019	Annual	8/14/2020	1315051
Anritsu	MA2411B	Pulse Power Sensor	8/8/2019	Annual	8/8/2020	1339008
Anritsu	ML2495A	Power Meter	11/20/2018	Annual	11/20/2019	1039008
Agilent	N5182A	MXG Vector Signal Generator	8/19/2019	Annual	8/19/2020	MY47420837
Seekonk	NC-100	Torque Wrench	5/9/2018	Biennial	5/9/2020	22217
Mini-Circuits	NLP-2950+	Low Pass Filter DC to 2700 MHz	CBT	N/A	CBT	N/A
MiniCircuits	ZHDC-16-63-S+	Bidirectional Coupler	CBT	N/A	CBT	N/A
MiniCircuits	VLF-6000+	Low Pass Filter	CBT	N/A	CBT	N/A
SPEAG	EX3DV4	SAR Probe	2/19/2019	Annual	2/19/2020	3914
SPEAG	EX3DV4	SAR Probe	5/16/2019	Annual	5/16/2020	7406
SPEAG	DAE4	Dasy Data Acquisition Electronics	5/8/2019	Annual	5/8/2020	859
SPEAG	DAE4	Dasy Data Acquisition Electronics	2/14/2019	Annual	2/14/2020	1272

Note: CBT (Calibrated Before Testing). Prior to testing, the measurement paths containing a cable, amplifier, attenuator, coupler or filter were connected to a calibrated source (i.e. a signal generator) to determine the losses of the measurement path.

Measurement Uncertainty = ±23% (k=2)

	Name	Function	Signature
Calibrated By:	Brodie Halbfoster	Team Lead Engineer	BRODIE HALBFOSTER
Approved By:	Kaitlin O'Keefe	Senior Technical Manager	XOK

Object:	Date Issued:	Page 1 of 4
D1900V2 – SN: 5d080	10/18/2019	Fage 1014

DIPOLE CALIBRATION EXTENSION

Per KDB 865664 D01, calibration intervals of up to three years may be considered for reference dipoles when it is demonstrated that the SAR target, impedance and return loss of a dipole have remained stable according to the following requirements:

- 1. The measured SAR does not deviate more than 10% from the target on the calibration certificate.
- 2. The return-loss does not deviate more than 20% from the previous measurement and meets the required 20dB minimum return-loss requirement.
- 3. The measurement of real or imaginary parts of impedance does not deviate more than 5Ω from the previous measurement.

The following dipole was checked to pass the above 3 requirements to have 2-year calibration period from the calibration date:

Calibration Date	Extension Date	Certificate Electrical Delay (ns)	Certificate SAR Target Head (1g) W/kg @ 20.0 dBm	Measured Head SAR (1g) W/kg @ 20.0 dBm	Deviation 1g (%)	Certificate SAR Target Head (10g) W/kg @ 20.0 dBm	Measured Head SAR (10g) W/kg @ 20.0 dBm	Deviation 10g (%)	Certificate Impedance Head (Ohm) Real	Measured Impedance Head (Ohm) Real	Difference (Ohm) Real	Certificate Impedance Head (Ohm) Imaginary	Measured Impedance Head (Ohm) Imaginary	Difference (Ohm) Imaginary	Certificate Return Loss Head (dB)	Measured Return Loss Head (dB)	Deviation (%)	PASS/FAIL
10/23/2018	10/18/2019	1.193	3.98	4.16	4.52%	2.07	2.13	2.90%	52.5	50.4	2.1	7.9	6.2	1.7	-21.8	-24.2	-10.90%	PASS
Calibration Date	Extension Date	Certificate Electrical Delay (ns)	Certificate SAR Target Body (1g) W/kg @ 20.0 dBm	Measured Body SAR (1g) W/kg @ 20.0 dBm	Deviation 1g (%)	Certificate SAR Target Body (10g) W/kg @ 20.0 dBm	Measured Body SAR (10g) W/kg @ 20.0 dBm	Deviation 10g (%)	Certificate Impedance Body (Ohm) Real	Measured (mpedance Body (Ohm) Real	Difference (Ohm) Real	Certificate Impedance Body (Ohm) Imaginary	Measured Impedance Body (Ohm) Imaginary	Difference (Ohm) Imaginary	Certificate Return Loss Body (dB)	Measured Return Loss Body (dB)	Deviation (%)	PASS/FAIL
10/23/2018	10/18/2019	1.193	3.92	4.21	7.40%	2.06	2.16	4.85%	48.1	46.5	1.6	8.1	6.6	1.5	-21.5	-22.2	-3.40%	PASS

Object:	Date Issued:	Daga 2 of 4
D1900V2 – SN: 5d080	10/18/2019	Fage 2 01 4

Impedance & Return-Loss Measurement Plot for Head TSL



14:46:49 18.10.2019

Object:	Date Issued:	Dago 2 of 4
D1900V2 – SN: 5d080	10/18/2019	Fage 5 01 4

Impedance & Return-Loss Measurement Plot for Body TSL



14:48:18 18.10.2019

Object:	Date Issued:	Dago 4 of 4
D1900V2 – SN: 5d080	10/18/2019	Fage 4 01 4

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

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Accreditation No.: SCS 0108

Accredited by the Swiss Accreditation Service (SAS) The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Certificate No: D2450V2-719_Aug19

CALIBRATION CERTIFICATE

Object	D2450V2 - SN:7	19	
Calibration procedure(s)	QA CAL-05.v11 Calibration Proce	dure for SAR Validation Sources b	etween 0.7-3 GHz
Calibration date:	August 14, 2019		BNW 68 20 20 9
This calibration certificate documer The measurements and the uncert	nts the traceability to nati ainties with confidence p	onal standards, which realize the physical units or robability are given on the following pages and a	of measurements (SI). re part of the certificate.
All calibrations have been conducte	ed in the closed laborato	ry facility: environment temperature (22 \pm 3)°C a	nd humidity < 70%.
Calibration Equipment used (M&TE	E critical for calibration)		
Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	03-Apr-19 (No. 217-02892/02893)	Apr-20
Power sensor NRP-Z91	SN: 103244	03-Apr-19 (No. 217-02892)	Apr-20
Power sensor NRP-Z91	SN: 103245	03-Apr-19 (No. 217-02893)	Apr-20
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-19 (No. 217-02894)	Apr-20
Type-N mismatch combination	SN: 5047,2 / 06327	04-Apr-19 (No. 217-02895)	Apr-20
Reference Probe EX3DV4	SN: 7349	29-May-19 (No. EX3-7349_May19)	May-20
DAE4	SN: 601	30-Apr-19 (No. DAE4-601_Apr19)	Apr-20
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB39512475	30-Oct-14 (in house check Feb-19)	In house check: Oct-20
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-18)	In house check: Oct-20
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-18)	In house check: Oct-19
Calibrated by:	Name Claudio Leubler	Function Laboratory Technician	Signature
Approved by:	Katja Pokovic	Technical Manager	tills
This calibration certificate shall not	be reproduced except in	full without written approval of the laboratory	Issued: August 15, 2019

Calibration Laboratory of

Schmid & Partner **Engineering AG** Zeughausstrasse 43, 8004 Zurich, Switzerland





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Glossarv:

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

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- Measurement Conditions: Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL: The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- Feed Point Impedance and Return Loss: These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- Electrical Delay: One-way delay between the SMA connector and the antenna feed point. • No uncertainty required.
- SAR measured: SAR measured at the stated antenna input power.
- SAR normalized: SAR as measured, normalized to an input power of 1 W at the antenna • connector.
- SAR for nominal TSL parameters: The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Accreditation No.: SCS 0108

Measurement Conditions

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

DASY Version	DASY5	V52.10.2
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
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	37.8 ± 6 %	1.83 mho/m ± 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	13.5 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	53.1 W/kg ± 17.0 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.25 W/kg

SAR measured	250 mW input power	6.25 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	24.7 W/kg ± 16.5 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	52.7	1 .95 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	50.8 ± 6 %	2.01 mho/m ± 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	13.0 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	50.8 W/kg ± 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	6.09 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	24.0 W/kg ± 16.5 % (k=2)

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	54.6 Ω + 5.6 jΩ
Return Loss	- 23.2 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	51.0 Ω + 8.4 jΩ
Return Loss	- 21.6 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.150 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
manalastared by	01 21(0

DASY5 Validation Report for Head TSL

Date: 14.08.2019

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:719

Communication System: UID 0 - CW; Frequency: 2450 MHz Medium parameters used: f = 2450 MHz; σ = 1.83 S/m; ϵ_r = 37.8; ρ = 1000 kg/m³ Phantom section: Flat Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 SN7349; ConvF(7.9, 7.9, 7.9) @ 2450 MHz; Calibrated: 29.05.2019
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.04.2019
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.2(1504); SEMCAD X 14.6.12(7470)

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

Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 117.1 V/m; Power Drift = 0.07 dB Peak SAR (extrapolated) = 26.6 W/kg SAR(1 g) = 13.5 W/kg; SAR(10 g) = 6.25 W/kg Maximum value of SAR (measured) = 21.8 W/kg



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

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 14.08.2019

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:719

Communication System: UID 0 - CW; Frequency: 2450 MHz Medium parameters used: f = 2450 MHz; σ = 2.01 S/m; ϵ_r = 50.8; ρ = 1000 kg/m³ Phantom section: Flat Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 SN7349; ConvF(7.94, 7.94, 7.94) @ 2450 MHz; Calibrated: 29.05.2019
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.04.2019
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.2(1504); SEMCAD X 14.6.12(7470)

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

Measurement grid: dx=5mm, dy=5mm, dz=5mmReference Value = 105.2 V/m; Power Drift = 0.03 dB Peak SAR (extrapolated) = 25.6 W/kg **SAR(1 g) = 13 W/kg; SAR(10 g) = 6.09 W/kg** Maximum value of SAR (measured) = 20.0 W/kg



0 dB = 20.0 W/kg = 13.01 dBW/kg

Impedance Measurement Plot for Body TSL

File	View	⊆hannel	Sweep	Calibration	<u>I</u> race <u>S</u>	tale Marker	5 <u>y</u> stem	<u>Wi</u> ndow <u>H</u> e	qle			
		Ch 1 Avg =	20					1: 2.4 2 2 2 4	450000 G 548.95 450000 G	Hz pH Hz	51.00 8.419 83.658 78.4	10 Ω 16 Ω mU 64 °
	Ch1: 8t	art 2.25000	GHz	azună							Stop 2.6500	00 GHz
10. 5.0	00						>	1: 2.	450000 G	Hz	-21.55	0 dB
10. 5.0 0.0	00 00						>	1: 2.	450000 G	Hz	-2 .55	D dB
10. 5.0 0.0 -5.0 -10	00)0)0)0)0)0							1: 2.	450000 G	Hz	-2 .55	0 dB
10. 5.0 0.0 -5.1 -10 -15 -20	00)0)0)0)0)00 ;.00							1: 2.	450000 G	Hz	-21.55	
10. 5.0 -5.1 -10 -15 -20 -25	00 00 00 00 00 00 00 00 00							1: 2.	450000 G	Hz	-21.55	
10. 5.0 -5.0 -10 -15 -20 -25 -25 -25	00 00 00 00 00 000 000							1: 2.		Hz	-21.55	
10. 5.0 -5.1 -10 -15 -20 -25 -30 -30 -40	00 00 00 00 000 0.00 0.00 0.00 0.00	12 311	20 GHz					1: 2.		Hz	-21.55	0 dB

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Accreditation No.: SCS 0108

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Certificate No: D2600V2-1064_Jun19

CALIBRATION CERTIFICATE

Object	D26001/2 - SNI:11)E/	
	D200072-011.11		
			BNV LogIQ
Calibration procedure(s)	QA CAL-05 v11		17/81/2014
	Calibration Proce	dure for SAB Validation Source	s between 0 7-3 GHz
	Culibration 11000	Care for CAIT validation bedice.	S Detween 0.7-0 On Z
	1		
Calibration date:	June 14, 2019		
This calibration certificate documer	nts the traceability to nati	onal standards, which realize the physical u	nits of measurements (SI).
The measurements and the uncerta	ainties with confidence p	robability are given on the following pages a	nd are part of the certificate.
All calibrations have been conducte	ed in the closed laborato	ry facility: environment temperature (22 \pm 3)°	°C and humidity < 70%.
Calibration Equipment used (M&TE	critical for calibration)		
Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	03-Apr-19 (No. 217-02892/02893)	Apr-20
Power sensor NRP-Z91	SN: 103244	03-Apr-19 (No. 217-02892)	Apr-20
Power sensor NRP-Z91	SN: 103245	03-Apr-19 (No. 217-02893)	Apr-20
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-19 (No. 217-02894)	Apr-20
Type-N mismatch combination	SN: 5047.2 / 06327	04-Apr-19 (No. 217-02895)	Apr-20
Reference Probe EX3DV4	SN: 7349	29-May-19 (No. EX3-7349_May19)	May-20
DAE4	SN: 601	30-Apr-19 (No. DAE4-601_Apr19)	Apr-20
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB39512475	30-Oct-14 (in house check Feb-19)	In house check: Oct-20
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-18)	In house check: Oct-20
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-18)	In house check: Oct-19
	Name	Function	Signature
Calibrated by:	Michael Weber	Laboratory Technician	1111 -
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Approved by:	Katja Pokovic	Technical Manager	2111
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	an a		
			Issued: June 20, 2019
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Calibration Laboratory of

Schmid & Partner Engineering AG Zeughausstrasse 43, 8004 Zurich, Switzerland





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Swiss Calibration Service

Accreditation No.: SCS 0108

Accredited by the Swiss Accreditation Service (SAS) The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Glossarv:

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

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- Measurement Conditions: Further details are available from the Validation Report at the end • of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL: The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- Feed Point Impedance and Return Loss: These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- Electrical Delay: One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- SAR measured: SAR measured at the stated antenna input power.
- SAR normalized: SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters: The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Measurement Conditions

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

DASY Version	DASY5	V52.10.2
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2600 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity	
Nominal Head TSL parameters	22.0 °C	39.0	1.96 mho/m 2.03 mho/m ± 6 %	
Measured Head TSL parameters	(22.0 ± 0.2) °C	37.3 ± 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	14.9 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	58.1 W/kg ± 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.59 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	26.0 W/kg ± 16.5 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity	
Nominal Body TSL parameters	22.0 °C	52.5	2.16 mho/m	
Measured Body TSL parameters	(22.0 ± 0.2) °C	(22.0 ± 0.2) °C 50.5 ± 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	14.2 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	55.6 W/kg ± 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	6.33 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	25.0 W/kg ± 16.5 % (k=2)

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Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	49.8 Ω - 6.9 jΩ
Return Loss	- 23.2 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	46.6 Ω - 4.4 jΩ
Return Loss	- 24.9 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.151 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
Manufactured by	SPEAG

DASY5 Validation Report for Head TSL

Date: 14.06.2019

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN:1064

Communication System: UID 0 - CW; Frequency: 2600 MHz Medium parameters used: f = 2600 MHz; $\sigma = 2.03$ 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(7.69, 7.69, 7.69) @ 2600 MHz; Calibrated: 29.05.2019
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.04.2019
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.2(1504); SEMCAD X 14.6.12(7470)

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

Measurement grid: dx=5mm, dy=5mm, dz=5mmReference Value = 120.9 V/m; Power Drift = 0.01 dB Peak SAR (extrapolated) = 30.2 W/kg **SAR(1 g) = 14.9 W/kg; SAR(10 g) = 6.59 W/kg** Maximum value of SAR (measured) = 25.1 W/kg



Impedance Measurement Plot for Head TSL

File	⊻iew	<u>C</u> hannel Sw <u>e</u> ep	Calibration Tra	ice <u>S</u> cale M <u>a</u> rker	System	<u>W</u> indow <u>H</u> e	lp		
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	Ch1:St	on iAvg ≈ 20 art 2.40000 GHz —						Stop 2	2.80000 GHz
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St	atus	CH 1: 511	C*	1-Port	Avg=20	Delay			LCL

DASY5 Validation Report for Body TSL

Date: 14.06.2019

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN:1064

Communication System: UID 0 - CW; Frequency: 2600 MHz Medium parameters used: f = 2600 MHz; $\sigma = 2.22$ S/m; $\varepsilon_r = 50.5$; $\rho = 1000$ kg/m³ Phantom section: Flat Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 SN7349; ConvF(7.8, 7.8, 7.8) @ 2600 MHz; Calibrated: 29.05.2019
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.04.2019
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.2(1504); SEMCAD X 14.6.12(7470)

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

Measurement grid: dx=5mm, dy=5mm, dz=5mmReference Value = 110.6 V/m; Power Drift = -0.05 dB Peak SAR (extrapolated) = 28.9 W/kg SAR(1 g) = 14.2 W/kg; SAR(10 g) = 6.33 W/kg Maximum value of SAR (measured) = 23.6 W/kg



0 dB = 23.6 W/kg = 13.73 dBW/kg
Impedance Measurement Plot for Body TSL

File	View	Channel	Sw <u>e</u> ep	Calibration	<u>Trace</u> <u>S</u> cale	e M <u>a</u> rker	System	Window	Help				
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10. 5.(0.(00 00						>	1:	2.600)000 G	Hz	-24	.891 dB
10. 5.(0.(-5.)							>	1:	2.600)000 G	Hz	-24	.891 dB
10, 5,(-5,(-10 -15	00 00 00 00 00.	**************************************					>	1:	2.800)000 G	Hz	-24	.891 dB
10. 5.(-5.) -10 -15 -20	00 00 00 00 00. 00.						>	1:	2.800	0000 C	Hz	-24	891 dB
10, 5,(-5,) -10 -15 -20 -25	00 90 90 90 90 90 90 90						>		2.800	0000 G	Hz	-24	.891 dB
10. 5.(-5.) -10 -15 -20 -25 -30	00 00 00 00 00 00 00						>		2.600	0000 G	Hz	-24	.991 dB
10. 5.(-5.) -10 -15 -20 -25 -30 -35 -30	00 00 00 00 00 00 00 00 00	18 512	20				>		2.600	0000 C	Hz	-24	891 dB
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S Swiss Calibration Service

Accreditation No.: SCS 0108

Accredited by the Swiss Accreditation Service (SAS) The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Client PC Test

Certificate No: D5GHzV2-1057_Jan18

Objeci	D5GHzV2 - SN:1	057	
Calibration procedure(s)	QA CAL-22.v2 Calibration proce	dure for dipole validation kits be	tween 3-6 GHz
			RN
Calibration date:	January 16, 2018	3	01-25-2018
This calibration cartificate docum	onie ina imagendiju to por	incluin derde which welfan the etc. Inclu	RNV
The measurements and the unce	rtaintles with confidence p	ional standards, which realize the physical un robability are given on the following pages a	nits of measurements (SI). p^{++} and are part of the certificate. $(n) + (n) + ($
All calibrations have been conduc	ted in the closed laborato	ry facility: environment lemperature (22 \pm 3)°	² C and humidity < 70%BN
Calibration Equipment used (M&1	E critical for calibration)		sull the
			Curr
Primery Standards	D#	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	04-Apr-17 (No. 217-02521/02522)	Apr-18
Power sensor NRP-Z91	SN: 103244	04-Act-17 (No. 217-02521)	Anr-18
Power sensor NRP-Z91	SN: 103245	04-Apr-17 (No. 217-02522)	Apr-18
Reference 20 dB Atlenuator	SN: 5058 (20k)	07-Apr-17 (No. 217-02528)	Apr-10
Type-N mismatch combination	SN: 5047.2 / 06327	07-Apr-17 (No. 217-02529)	Anr-18
Reference Probe EX3DV4	SN: 3503	30-Dec-17 (No EX3-3503 Dec17)	
DAE4	SN: 601	26-Oct-17 (No. DAE4-601_Oct17)	Oct-18
Samadary Standarda	lina	Oback Data to be a	
Power mater EDM 4404		CRECK Date (In nouse)	Scheduled Check
Power concer HP 9/94A	ON. GD0/400/04	07-Oct-15 (in nouse check Oct-16)	in house check: Oct-18
	SN: US3/292/83	07-0ct-15 (in house check Oct-16)	in house check: Oct-18
FUNCI SCINCT AF 6461A	GN: M141092317	U/-Uct-15 (in house check Oct-16)	In house check: Oct-18
Notwork Applyment ID 87505	SN: 1009/2	15-Jun-15 (in house check Oct-16)	In house check; Oct-18
Network Analyzer HP 8753E	SN: US37390585	18-Oct-01 (in house check Oct-17)	In house check: Oct-18
	Name	Function	Signature
O BAR AND A REAL	Leif Klysner	Laboratory Technician	Defligen
Calibrated by:			
Callbrated by: Approved by:	Katja Pokovic	Technical Manager	66165

Certificate No: D5GHzV2-1057_Jan18

Calibration Laboratory of

Schmid & Partner **Engineering AG** Zeughausstrasse 43, 8004 Zurich, Switzerland





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- S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS) The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- Measurement Conditions: Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL: The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- Feed Point Impedance and Return Loss: These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- SAR measured: SAR measured at the stated antenna input power.
- SAR normalized: SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters: The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Accreditation No.: SCS 0108

Measurement Conditions

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

DASY Version	DASY5	V52.10.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy = 4.0 mm, dz = 1.4 mm	Graded Ratio = 1.4 (Z direction)
Frequency	5200 MHz ± 1 MHz 5250 MHz ± 1 MHz 5600 MHz ± 1 MHz 5750 MHz ± 1 MHz 5800 MHz ± 1 MHz	

Head TSL parameters at 5250 MHz The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.9	4.71 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	36.2 ± 6 %	4.55 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C		

SAR result with Head TSL at 5250 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	7.91 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	79.2 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.28 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	22.8 W/kg ± 19.5 % (k=2)

Head TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.5	5.07 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.8 ± 6 %	4.90 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C		

SAR result with Head TSL at 5600 MHz

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.41 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	84.1 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.40 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	24.0 W/kg ± 19.5 % (k=2)

Head TSL parameters at 5750 MHz The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.4	5.22 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.5 ± 6 %	5.06 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C		

SAR result with Head TSL at 5750 MHz

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.06 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	80.5 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.30 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	23.0 W/kg ± 19.5 % (k=2)

Body TSL parameters at 5200 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	49.0	5.30 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	47.3 ± 6 %	5.41 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C		

SAR result with Body TSL at 5200 MHz

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.36 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	73.1 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.06 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	20.4 W/kg ± 19.5 % (k=2)

Body TSL parameters at 5250 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.9	5.36 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	47.2 ± 6 %	5.48 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C		

SAR result with Body TSL at 5250 MHz

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.64 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	75.9 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.13 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	21.1 W/kg ± 19.5 % (k=2)

Body TSL parameters at 5600 MHz The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.5	5.77 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.6 ± 6 %	5.94 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C		

SAR result with Body TSL at 5600 MHz

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	8.05 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	79.9 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.25 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	22.3 W/kg ± 19.5 % (k=2)

Body TSL parameters at 5750 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.3	5.94 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.3 ± 6 %	6.15 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C		

SAR result with Body TSL at 5750 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.72 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	76.7 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.14 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	21.2 W/kg ± 19.5 % (k=2)

Body TSL parameters at 5800 MHz The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.2	6.00 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.2 ± 6 %	6.22 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C		

SAR result with Body TSL at 5800 MHz

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.68 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	76.3 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.13 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	21.1 W/kg ± 19.5 % (k=2)

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL at 5250 MHz

Impedance, transformed to feed point	50.0 Ω - 5.5 jΩ
Return Loss	- 25.2 dB

Antenna Parameters with Head TSL at 5600 MHz

Impedance, transformed to feed point	54.7 Ω - 2.1 jΩ
Return Loss	- 26.2 dB

Antenna Parameters with Head TSL at 5750 MHz

Impedance, transformed to feed point	52.7 Ω + 0.0 jΩ
Return Loss	- 31.5 dB

Antenna Parameters with Body TSL at 5200 MHz

Impedance, transformed to feed point	49.3 Ω - 6.7 jΩ
Return Loss	- 23.4 dB

Antenna Parameters with Body TSL at 5250 MHz

Impedance, transformed to feed point	48.4 Ω - 3.9 jΩ
Return Loss	- 27.4 dB

Antenna Parameters with Body TSL at 5600 MHz

Impedance, transformed to feed point	55.3 Ω - 1.6 jΩ
Return Loss	- 25.6 dB

Antenna Parameters with Body TSL at 5750 MHz

Impedance, transformed to feed point	52.6 Ω + 1.1 jΩ
Return Loss	- 31.2 dB

Antenna Parameters with Body TSL at 5800 MHz

Impedance, transformed to feed point	51.8 Ω - 0.4 jΩ
Return Loss	- 34.9 dB

General Antenna Parameters and Design

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	November 27, 2006

Appendix (Additional assessments outside the scope of SCS 0108)

Measurement Conditions (f=5200 MHz)

DASY system configuration, as far as not given on page 1 and 3.

Phantom	SAM Head Phantom	For usage with cSAR3DV2-R/L

SAR result with SAM Head (Top)

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.24 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	82.6 W/kg ± 20.3 % (k=2)
	· · ·	
SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.35 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	23.6 W/kg ± 19.9 % (k=2)

SAR result with SAM Head (Mouth)

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.54 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	85.6 W/kg ± 20.3 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.37 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	23.7 W/kg ± 19.9 % (k=2)

SAR result with SAM Head (Neck)

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.14 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	81.6 W/kg ± 20.3 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.37 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	23.7 W/kg ± 19.9 % (k=2)

SAR result with SAM Head (Ear)

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	5.16 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	51.7 W/kg ± 20.3 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	1.76 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	17.7 W/kg ± 19.9 % (k=2)

Measurement Conditions (f=5800 MHz)

DASY system configuration, as far as not given on page 1 and 3.

Phantom	SAM Head Phantom	For usage with cSAR3DV2-R/L
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SAR result with SAM Head (Top)

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.62 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	86.3 W/kg ± 20.3 % (k=2)
SAR averaged over 10 $\rm cm^3$ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.41 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	24.1 W/kg ± 19.9 % (k=2)

SAR result with SAM Head (Mouth)

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.88 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	88.9 W/kg ± 20.3 % (k=2)
SAR for nominal Head TSL parameters	normalized to 1W	88.9 W/kg ± 20.3 % (k=

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.44 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	24.4 W/kg ± 19.9 % (k=2)

SAR result with SAM Head (Neck)

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition		
SAR measured	100 mW input power	8.33 W/kg	
SAR for nominal Head TSL parameters	normalized to 1W	83.4 W/kg ± 20.3 % (k=2)	
SAB averaged over 10 cm ³ (10 d) of Head TSI	condition		

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.35 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	23.5 W/kg ± 19.9 % (k=2)

SAR result with SAM Head (Ear)

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	5.68 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	56.8 W/kg ± 20.3 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	1.89 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	18.9 W/kg ± 19.9 % (k=2)

DASY5 Validation Report for Head TSL

Date: 11.01.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1057

Communication System: UID 0 - CW; Frequency: 5250 MHz, Frequency: 5600 MHz, Frequency: 5750 MHz Medium parameters used: f = 5250 MHz; $\sigma = 4.55$ S/m; $\varepsilon_r = 36.2$; $\rho = 1000$ kg/m³, Medium parameters used: f = 5600 MHz; $\sigma = 4.9$ S/m; $\varepsilon_r = 35.8$; $\rho = 1000$ kg/m³, Medium parameters used: f = 5750 MHz; $\sigma = 5.06$ S/m; $\varepsilon_r = 35.5$; $\rho = 1000$ kg/m³ Phantom section: Flat Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 SN3503; ConvF(5.51, 5.51, 5.51); Calibrated: 30.12.2017, ConvF(5.05, 5.05, 5.05); Calibrated: 30.12.2017, ConvF(4.98, 4.98, 4.98); Calibrated: 30.12.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601 modified; Calibrated: 26.10.2017
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5250 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm Reference Value = 72.54 V/m; Power Drift = -0.02 dB Peak SAR (extrapolated) = 27.5 W/kg SAR(1 g) = 7.91 W/kg; SAR(10 g) = 2.28 W/kg Maximum value of SAR (measured) = 17.7 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm Reference Value = 72.77 V/m; Power Drift = -0.07 dB Peak SAR (extrapolated) = 32.2 W/kg SAR(1 g) = 8.41 W/kg; SAR(10 g) = 2.4 W/kg Maximum value of SAR (measured) = 19.7 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5750 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm Reference Value = 70.93 V/m; Power Drift = -0.09 dB Peak SAR (extrapolated) = 31.4 W/kg SAR(1 g) = 8.06 W/kg; SAR(10 g) = 2.3 W/kg Maximum value of SAR (measured) = 18.9 W/kg



0 dB = 18.9 W/kg = 12.76 dBW/kg



DASY5 Validation Report for Body TSL

Date: 10.01.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1057

Communication System: UID 0 - CW; Frequency: 5200 MHz, Frequency: 5250 MHz, Frequency: 5600 MHz, Frequency: 5750 MHz, Frequency: 5800 MHz Medium parameters used: f = 5200 MHz; $\sigma = 5.41$ S/m; $\varepsilon_r = 47.3$; $\rho = 1000$ kg/m³, Medium parameters used: f = 5250 MHz; $\sigma = 5.48$ S/m; $\varepsilon_r = 47.2$; $\rho = 1000$ kg/m³, Medium parameters used: f = 5600 MHz; $\sigma = 5.94$ S/m; $\varepsilon_r = 46.6$; $\rho = 1000$ kg/m³, Medium parameters used: f = 5750 MHz; $\sigma = 6.15$ S/m; $\varepsilon_r = 46.3$; $\rho = 1000$ kg/m³, Medium parameters used: f = 5800 MHz; $\sigma = 6.22$ S/m; $\varepsilon_r = 46.2$; $\rho = 1000$ kg/m³ Phantom section: Flat Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 SN3503; ConvF(5.35, 5.35, 5.35); Calibrated: 30.12.2017, ConvF(5.26, 5.26, 5.26); Calibrated: 30.12.2017, ConvF(4.65, 4.65, 4.65); Calibrated: 30.12.2017, ConvF(4.57, 4.57, 4.57); Calibrated: 30.12.2017, ConvF(4.53, 4.53, 4.53); 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 52.10.0(1446); SEMCAD X 14.6.10(7417)

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm Reference Value = 64.05 V/m; Power Drift = -0.03 dB Peak SAR (extrapolated) = 27.6 W/kg SAR(1 g) = 7.36 W/kg; SAR(10 g) = 2.06 W/kg Maximum value of SAR (measured) = 17.1 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5250 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm Reference Value = 64.53 V/m; Power Drift = -0.02 dB Peak SAR (extrapolated) = 29.4 W/kg SAR(1 g) = 7.64 W/kg; SAR(10 g) = 2.13 W/kg Maximum value of SAR (measured) = 17.9 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan,

dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm Reference Value = 65.09 V/m; Power Drift = -0.08 dB Peak SAR (extrapolated) = 34.0 W/kg SAR(1 g) = 8.05 W/kg; SAR(10 g) = 2.25 W/kg Maximum value of SAR (measured) = 19.5 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5750 MHz/Zoom Scan,

dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm Reference Value = 63.45 V/m; Power Drift = -0.06 dB Peak SAR (extrapolated) = 32.9 W/kg SAR(1 g) = 7.72 W/kg; SAR(10 g) = 2.14 W/kg Maximum value of SAR (measured) = 18.9 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm Reference Value = 63.14 V/m; Power Drift = -0.08 dB Peak SAR (extrapolated) = 33.3 W/kg SAR(1 g) = 7.68 W/kg; SAR(10 g) = 2.13 W/kg



0 dB = 18.9 W/kg = 12.76 dBW/kg

Impedance Measurement Plot for Body TSL



DASY5 Validation Report for SAM Head

Date: 16.01.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN:1057

Communication System: UID 0 - CW; Frequency: 5200 MHz, Frequency: 5800 MHz Medium parameters used: f = 5200 MHz; $\sigma = 4.59$ S/m; $\epsilon r = 36.5$; $\rho = 1000$ kg/m3, Medium parameters used: f = 5800 MHz; $\sigma = 5.28$ S/m; $\epsilon r = 35.4$; $\rho = 1000$ kg/m3 Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: EX3DV4 SN3503; ConvF(5.75, 5.75, 5.75); Calibrated: 30.12.2017, ConvF(4.96, 4.96, 4.96); Calibrated: 30.12.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: SAM Head
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

SAM Head/Top - 5200/Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm,

dz=1.4mm Reference Value = 72.99 V/m; Power Drift = 0.04 dB Peak SAR (extrapolated) = 30.6 W/kg SAR(1 g) = 8.24 W/kg; SAR(10 g) = 2.35 W/kg Maximum value of SAR (measured) = 19.7 W/kg

SAM Head/Top - 5800/Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mmReference Value = 73.00 V/m; Power Drift = 0.07 dB Peak SAR (extrapolated) = 36.5 W/kg SAR(1 g) = 8.62 W/kg; SAR(10 g) = 2.41 W/kg Maximum value of SAR (measured) = 21.9 W/kg

SAM Head/Mouth - 5200/Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm Reference Value = 72.79 V/m; Power Drift = -0.04 dB Peak SAR (extrapolated) = 29.5 W/kg SAR(1 g) = 8.54 W/kg; SAR(10 g) = 2.37 W/kg Maximum value of SAR (measured) = 20.7 W/kg SAM Head/Mouth - 5800/Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm Reference Value = 71.69 V/m; Power Drift = -0.07 dB Peak SAR (extrapolated) = 34.9 W/kg

SAR(1 g) = 8.88 W/kg; SAR(10 g) = 2.44 W/kgMaximum value of SAR (measured) = 23.0 W/kg

SAM Head/Neck - 5200/Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm,

dz=1.4mm Reference Value = 72.48 V/m; Power Drift = 0.05 dB Peak SAR (extrapolated) = 27.9 W/kg SAR(1 g) = 8.14 W/kg; SAR(10 g) = 2.37 W/kg Maximum value of SAR (measured) = 19.3 W/kg

SAM Head/Neck - 5800/Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm Reference Value = 72.90 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 33.4 W/kgSAR(1 g) = 8.33 W/kg; SAR(10 g) = 2.35 W/kgMaximum value of SAR (measured) = 21.8 W/kg

SAM Head/Ear - 5200/Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm Reference Value = 54.68 V/m; Power Drift = 0.03 dB Peak SAR (extrapolated) = 16.3 W/kg SAR(1 g) = 5.16 W/kg; SAR(10 g) = 1.76 W/kg Maximum value of SAR (measured) = 11.1 W/kg

SAM Head/Ear - 5800/Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm Reference Value = 56.96 V/m; Power Drift = -0.05 dB Peak SAR (extrapolated) = 21.2 W/kg SAR(1 g) = 5.68 W/kg; SAR(10 g) = 1.89 W/kg Maximum value of SAR (measured) = 13.8 W/kg



0 dB = 13.8 W/kg = 11.40 dBW/kg



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http://www.pctest.com



Certification of Calibration

Object

D5GHzV2 - SN: 1057

Calibration procedure(s) Procedure for Calibration Extension for SAR Dipoles.

1/16/2019

Extension Calibration date:

Description:

SAR Validation Dipole at 5250, 5600, and 5750 MHz.

Calibration Equipment used:

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent	8753ES	S-Parameter Network Analyzer	2/8/2018	Annual	2/8/2019	US39170122
Agilent	N5182A	MXG Vector Signal Generator	4/18/2018	Annual	4/18/2019	MY47420800
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	433971
Anritsu	MA2411B	Pulse Power Sensor	3/2/2018	Annual	3/2/2019	1207364
Anritsu	MA2411B	Pulse Power Sensor	3/2/2018	Annual	3/2/2019	1339018
Anritsu	ML2495A	Power Meter	10/21/2018	Annual	10/21/2019	941001
Control Company	4040	Therm./Clock/Humidity Monitor	3/31/2017	Biennial	3/31/2019	170232394
Control Company	4352	Ultra Long Stem Thermometer	5/2/2017	Biennial	5/2/2019	170330156
Keysight	772D	Dual Directional Coupler	CBT	N/A	CBT	MY52180215
Keysight Technologies	85033E	Standard Mechanical Calibration Kit (DC to 9GHz, 3.5mm)	6/4/2018	Annual	6/4/2019	MY53401181
MiniCircuits	VLF-6000+	Low Pass Filter	CBT	N/A	CBT	N/A
Mini-Circuits	BW-N20W5+	DC to 18 GHz Precision Fixed 20 dB Attenuator	CBT	N/A	CBT	N/A
Narda	4772-3	Attenuator (3dB)	CBT	N/A	CBT	9406
Pasternack	PE2209-10	Bidirectional Coupler	CBT	N/A	CBT	N/A
Seekonk	NC-100	Torque Wrench	7/11/2018	Annual	7/11/2019	N/A
SPEAG	DAE4	Dasy Data Acquisition Electronics	10/3/2018	Annual	10/3/2019	1558
SPEAG	DAE4	Dasy Data Acquisition Electronics	6/18/2018	Annual	6/18/2019	1334
SPEAG	DAK-3.5	Dielectric Assessment Kit	9/11/2018	Annual	9/11/2019	1091
SPEAG	EX3DV4	SAR Probe	8/23/2018	Annual	8/23/2019	7308
SPEAG	EX3DV4	SAR Probe	6/25/2018	Annual	6/25/2019	7409

Measurement Uncertainty = ±23% (k=2)

	Name	Function	Signature
Calibrated By:	Brodie Halbfoster	Test Engineer	BRODIE HALBFOSTER
Approved By:	Kaitlin O'Keefe	Senior Technical Manager	XOK

Object:	Date Issued:	Dogo 1 of 4
D5GHzV2 – SN: 1057	01/16/2019	Fage 1014

DIPOLE CALIBRATION EXTENSION

Per KDB 865664 D01, calibration intervals of up to three years may be considered for reference dipoles when it is demonstrated that the SAR target, impedance and return loss of a dipole have remained stable according to the following requirements:

- 1. The measured SAR does not deviate more than 10% from the target on the calibration certificate.
- 2. The return-loss does not deviate more than 20% from the previous measurement and meets the required 20dB minimum return-loss requirement.
- 3. The measurement of real or imaginary parts of impedance does not deviate more than 5Ω from the previous measurement.

The following dipole was checked to pass the above 3 requirements to have 2-year calibration period from the calibration date:

Frequency (MHz)	Calibration Date	Extension Date	Certificate Electrical Delay (ns)	Certificate SAR Target Head (1g) W/kg @ 17.0 dBm	Measured Head SAR (1g) W/kg @ 17.0 dBm	Deviation 1g (%)	Certificate SAR Target Head (10g) W/kg @ 17.0 dBm	Measured Head SAR (10g) W/kg @ 17.0 dBm	Deviation 10g (%)	Certificate Impedance Head (Ohm) Real	Measured Impedance Head (Ohm) Real	Difference (Ohm) Real	Certificate Impedance Head (Ohm) Imaginary	Measured Impedance Head (Ohm) Imaginary	Difference (Ohm) Imaginary	Certificate Return Loss Head (dB)	Measured Return Loss Head (dB)	Deviation (%)	PASS/FAIL
5250	1/16/2018	1/16/2019	1.203	3.96	3.63	-8.33%	1.14	1.04	-8.77%	50	47.6	2.4	-5.5	-6.7	1.2	-25.2	-22.8	9.60%	PASS
5600	1/16/2018	1/16/2019	1.203	4.205	3.84	-8.68%	1.2	1.09	-9.17%	54.7	52.5	2.2	-2.1	1.6	3.7	-26.2	-30.6	-16.80%	PASS
5750	1/16/2018	1/16/2019	1.203	4.025	3.76	-6.58%	1.15	1.07	-6.96%	52.7	54.4	1.7	0	0.1	0.1	-31.5	-27.5	12.70%	PASS
Frequency (MHz)	Calibration Date	Extension Date	Certificate Electrical Delay (ns)	Certificate SAR Target Body (1g) W/kg @ 17.0 dBm	Measured Body SAR (1g) W/kg @ 17.0 dBm	Deviation 1g (%)	Certificate SAR Target Body (10g) W/kg @ 17.0 dBm	Measured Body SAR (10g) W/kg @ 17.0 dBm	Deviation 10g (%)	Certificate Impedance Body (Ohm) Real	Measured Impedance Body (Ohm) Real	Difference (Ohm) Real	Certificate Impedance Body (Ohm) Imaginary	Measured Impedance Body (Ohm) Imaginary	Difference (Ohm) Imaginary	Certificate Return Loss Body (dB)	Measured Return Loss Body (dB)	Deviation (%)	PASS/FAIL
5250	1/16/2018	1/16/2019	1.203	3.795	3.73	-1.71%	1.06	1.03	-2.37%	48.4	45.9	2.5	-3.9	-4	0.1	-27.4	-24.5	10.50%	PASS
5600	1/16/2018	1/16/2019	1.203	3.995	4.06	1.63%	1.12	1.12	0.45%	55.3	51	4.3	-1.6	2.8	4.4	-25.6	-30.7	-20.00%	PASS
5750	1/16/2018	1/16/2019	1.203	3.835	3.65	-4.82%	1.06	1.02	-3.77%	52.6	52.9	0.3	1.1	0.6	0.5	-31.2	-30.7	1.60%	PASS

Object:	Date Issued:	Page 2 of 4	
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Impedance & Return-Loss Measurement Plot for Head TSL

Object:	Date Issued:	Page 3 of 4	
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Impedance & Return-Loss Measurement Plot for Body TSL

Object:	Date Issued:	Page 4 of 4
D5GHzV2 – SN: 1057	01/16/2019	Fage 4 01 4





Certification of Calibration

Object

D5GHzV2 – SN: 1057

Calibration procedure(s) Procedure for Calibration Extension for SAR Dipoles.

1/16/2020

Extension Calibration date:

Description:

SAR Validation Dipole at 5250, 5600, and 5750 MHz.

Calibration Equipment used:

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Control Company	4040	Therm./Clock/Humidity Monitor	6/29/2019	Biennial	6/29/2021	192291470
Control Company	4352	Ultra Long Stem Thermometer	8/2/2018	Biennial	8/2/2020	181334684
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	433971
Narda	4772-3	Attenuator (3dB)	CBT	N/A	CBT	9406
Keysight Technologies	85033E	Standard Mechanical Calibration Kit (DC to 9GHz, 3.5mm)	7/2/2019	Annual	7/2/2020	MY53401181
Rohde & Schwarz	ZNLE6	Vector Network Analyzer	10/11/2019	Annual	10/11/2020	101307
Mini-Circuits	BW-N20W5+	DC to 18 GHz Precision Fixed 20 dB Attenuator	CBT	N/A	CBT	N/A
SPEAG	DAKS-3.5	Portable DAK	9/10/2019	Annual	9/10/2020	1045
Anritsu	MA2411B	Pulse Power Sensor	8/14/2019	Annual	8/14/2020	1315051
Anritsu	MA2411B	Pulse Power Sensor	8/8/2019	Annual	8/8/2020	1339008
Anritsu	ML2495A	Power Meter	1/15/2020	Annual	1/15/2021	1328004
Agilent	N5182A	MXG Vector Signal Generator	8/19/2019	Annual	8/19/2020	MY47420837
Seekonk	NC-100	Torque Wrench	5/9/2018	Biennial	5/9/2020	22217
MiniCircuits	ZHDC-16-63-S+	Bidirectional Coupler	CBT	N/A	CBT	N/A
MiniCircuits	VLF-6000+	Low Pass Filter	CBT	N/A	CBT	N/A
SPEAG	EX3DV4	SAR Probe	5/16/2019	Annual	5/16/2020	7406
SPEAG	EX3DV4	SAR Probe	6/19/2019	Annual	6/19/2020	7409
SPEAG	DAE4	Dasy Data Acquisition Electronics	6/20/2019	Annual	6/20/2020	1334
SPEAG	DAE4	Dasy Data Acquisition Electronics	5/8/2019	Annual	5/8/2020	728

Measurement Uncertainty = $\pm 23\%$ (k=2)

	Name	Function	Signature
Calibrated By:	Brodie Halbfoster	Test Engineer	BRODIE HALBFOSTER
Approved By:	Kaitlin O'Keefe	Senior Technical Manager	XOK

Object:	Date Issued:	Daga 1 of 4
D5GHzV2 – SN: 1057	01/16/2020	Fage 1014

DIPOLE CALIBRATION EXTENSION

Per KDB 865664 D01, calibration intervals of up to three years may be considered for reference dipoles when it is demonstrated that the SAR target, impedance and return loss of a dipole have remained stable according to the following requirements:

- 1. The measured SAR does not deviate more than 10% from the target on the calibration certificate.
- 2. The return-loss does not deviate more than 20% from the previous measurement and meets the required 20dB minimum return-loss requirement.
- 3. The measurement of real or imaginary parts of impedance does not deviate more than 5Ω from the previous measurement.

The following dipole was checked to pass the above 3 requirements to have 3-year calibration period from the calibration date:

Frequency (MHz)	Calibration Date	Extension Date	Certificate Electrical Delay (ns)	Certificate SAR Target Head (1g) W/kg @ 17.0 dBm	Measured Head SAR (1g) W/kg @ 17.0 dBm	Deviation 1g (%)	Certificate SAR Target Head (10g) W/kg @ 17.0 dBm	Measured Head SAR (10g) W/kg @ 17.0 dBm	Deviation 10g (%)	Certificate Impedance Head (Ohm) Real	Measured Impedance Head (Ohm) Real	Difference (Ohm) Real	Certificate Impedance Head (Ohm) Imaginary	Measured Impedance Head (Ohm) Imaginary	Difference (Ohm) Imaginary	Certificate Return Loss Head (dB)	Measured Return Loss Head (dB)	Deviation (%)	PASS/FAIL
5250	1/16/2018	1/16/2020	1.203	3.96	3.72	-6.06%	1.14	1.05	-7.89%	50	46.9	3.1	-5.5	-6.3	0.8	-25.2	-22.8	9.50%	PASS
5600	1/16/2018	1/16/2020	1.203	4.205	3.91	-7.02%	1.2	1.11	-7.50%	54.7	52.9	1.8	-2.1	-1.4	0.7	-26.2	-30.2	-15.20%	PASS
5750	1/16/2018	1/16/2020	1.203	4.025	3.72	-7.58%	1.15	1.05	-8.70%	52.7	52.4	0.4	0	-2.3	2.3	-31.5	-29.8	5.30%	PASS
Frequency (MHz)	Calibration Date	Extension Date	Certificate Electrical Delay (ns)	Certificate SAR Target Body (1g) W/kg @ 17.0 dBm	Measured Body SAR (1g) W/kg @ 17.0 dBm	Deviation 1g (%)	Certificate SAR Target Body (10g) W/kg @ 17.0 dBm	Measured Body SAR (10g) W/kg @ 17.0 dBm	Deviation 10g (%)	Certificate Impedance Body (Ohm) Real	Measured Impedance Body (Ohm) Real	Difference (Ohm) Real	Certificate Impedance Body (Ohm) Imaginary	Measured Impedance Body (Ohm) Imaginary	Difference (Ohm) Imaginary	Certificate Return Loss Body (dB)	Measured Return Loss Body (dB)	Deviation (%)	PASS/FAIL
5250	1/16/2018	1/16/2020	1.203	3.795	3.75	-1.19%	1.06	1.04	-1.42%	48.4	51	2.6	-3.9	-2.8	1.1	-27.4	-30.6	-11.80%	PASS
5600	1/16/2018	1/16/2020	1.203	3.995	3.98	-0.38%	1.12	1.1	-1.35%	55.3	53.6	1.7	-1.6	0.2	1.8	-25.6	-29.2	-14.00%	PASS
5750	1/16/2018	1/16/2020	1.203	3.835	3.87	0.91%	1.06	1.06	0.00%	52.6	52.8	0.2	1.1	0.5	0.6	-31.2	-31.4	-0.20%	PASS

Object:	Date Issued:	Page 2 of 4
D5GHzV2 – SN: 1057	01/16/2020	Fage 2 01 4



Impedance & Return-Loss Measurement Plot for Head TSL

Object:	Date Issued:	Page 3 of 4	
D5GHzV2 – SN: 1057	01/16/2020	Fage 5 01 4	



Impedance & Return-Loss Measurement Plot for Body TSL

Object:	Date Issued:	Page 4 of 4	
D5GHzV2 – SN: 1057	01/16/2020	Fage 4 01 4	

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Accreditation I	No.:	SCS	0108

Certificate No: D750V3-1161_Oct18

PC Test Client

CALIBRATION C	BRIEKA I:	E	
Object	D750V3 - SN:11(51	
Calibration procedure(s)	QA CAL-05.v10 Calibration proce	dure for dipole validation kits al	pove 700 MHz
Calibration date:	October 19, 2018)	BN 10-30-2018
This calibration certificate documer	its the traceability to nati	onal standards, which realize the physical	units of measurements (SI). BNV
The measurements and the uncertain	ainties with confidence p	robability are given on the following pages	and are part of the certificate. 10^{-20}
All calibrations have been conducte Calibration Equipment used (M&TE	ed in the closed laborato critical for calibration)	ry facility: environment temperature (22 \pm 3)°C and humidity < 70%.
Primary Standards	ה#	Cal Date (Cortificate No.)	Scheduled Calibration
Power mater NRP	SN: 104778	04-Apr-18 (No. 217-02672/02673)	
Power sensor NRP-Z91	SN: 103244	04-Apr-18 (No. 217-02672)	Apr-19
Power sensor NRP-Z91	SN: 103245	04-Apr-18 (No. 217-02673)	Apr-19
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-18 (No. 217-02682)	Apr-19
Type-N mismatch combination	SN: 5047.2 / 06327	04-Apr-18 (No. 217-02683)	Apr-19
Reference Probe EX3DV4	SN: 7349	30-Dec-17 (No. EX3-7349_Dec17)	Dec-18
DAE4	SN: 601	04-Oct-18 (No. DAE4-601_Oct18)	Oct-19
Secondary Standards		Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (In house check Oct-18)	In house check: Oct-20
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-18)	In house check: Oct-20
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-18)	In house check: Oct-19
	Name	Function	Signature
Calibrated by:	Manu Seitz	Laboratory Technician	-
			A Contraction of the contraction
Approved by:	Katja Pokovic	Technical Manager	Lelly
			Issued: October 22, 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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Accreditat

Accreditation No.: SCS 0108

Accredited by the Swiss Accreditation Service (SAS) The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL: The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- Feed Point Impedance and Return Loss: These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- SAR measured: SAR measured at the stated antenna input power.
- SAR normalized: SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters: The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Measurement Conditions

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

	v i v	
DASY Version	DASY5	V52.10.2
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	750 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.9	0.89 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.8 ± 6 %	0.89 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C		m == ===

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.02 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	8.03 W/kg ± 17.0 % (k=2)
μ	······································	
SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.32 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	5.26 W/kg ± 16.5 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	55.5	0.96 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	55.1 ± 6 %	0.96 mho/m ± 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	2.11 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	8.43 W/kg ± 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.39 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	5.55 W/kg ± 16.5 % (k=2)

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	55.6 Ω - 1.9 jΩ				
Return Loss	- 25.0 dB				

Antenna Parameters with Body TSL

Impedance, transformed to feed point	50.6 Ω - 4.2 jΩ				
Return Loss	- 27.6 dB				

General Antenna Parameters and Design

Electrical Delay (one direction)	1.032 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
Manufactured on	November 19, 2015

DASY5 Validation Report for Head TSL

Date: 19.10.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN:1161

Communication System: UID 0 - CW; Frequency: 750 MHz Medium parameters used: f = 750 MHz; $\sigma = 0.89$ S/m; $\varepsilon_r = 40.8$; $\rho = 1000$ kg/m³ Phantom section: Flat Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 SN7349; ConvF(10.22, 10.22, 10.22) @ 750 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.10.2018
- Phantom: Flat Phantom 4.9 (front); Type: QD 00L P49 AA; Serial: 1001
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mmReference Value = 58.51 V/m; Power Drift = -0.04 dB Peak SAR (extrapolated) = 3.04 W/kg SAR(1 g) = 2.02 W/kg; SAR(10 g) = 1.32 W/kg Maximum value of SAR (measured) = 2.70 W/kg



0 dB = 2.70 W/kg = 4.31 dBW/kg

<u>F</u> ile	⊻iew	<u>C</u> hannel	Sw <u>e</u> ep	Calibration	<u>T</u> race <u>S</u> cale	e M <u>a</u> rker	S <u>y</u> stem <u>V</u>	<u>V</u> indow <u>H</u> e	lp			
					A			: 750.0 50.0	112.30	Hz pF Hz	55 - 1.3 56.1 - 1	i.621 Ω 8896 Ω 38 mU 7.556 °
	Ch1: St	Ch 1 Avg = art 550,000 t	20 에Hz	50004							Stop 95	0.000 MHz
10. 5.(-5.) -10 -15 -20 -25 -30 -35 -40	00)0)0 ,00 ,00 ,00 ,00 ,00 Ch1: St	<u>Ch 1 Avg =</u> art 550.000 l	20 MHz				> 1	. 750.0		Hz	-25.	015 dB
St	atus	CH 1:	511		C* 1-Port		Ava=20 D	elau				C

DASY5 Validation Report for Body TSL

Date: 19.10.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN:1161

Communication System: UID 0 - CW; Frequency: 750 MHz Medium parameters used: f = 750 MHz; σ = 0.96 S/m; ϵ_r = 55.1; ρ = 1000 kg/m³ Phantom section: Flat Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 SN7349; ConvF(10.19, 10.19, 10.19) @ 750 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.10.2018
- Phantom: Flat Phantom 4.9 (Back); Type: QD 00R P49 AA; Serial: 1005
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mmReference Value = 57.57 V/m; Power Drift = -0.02 dB Peak SAR (extrapolated) = 3.18 W/kg SAR(1 g) = 2.11 W/kg; SAR(10 g) = 1.39 W/kg Maximum value of SAR (measured) = 2.83 W/kg



0 dB = 2.83 W/kg = 4.52 dBW/kg
Impedance Measurement Plot for Body TSL

Eile	<u>V</u> iew	<u>C</u> hannel	Sweep	Calibration	<u>T</u> race <u>S</u> cale	Marker	System <u>V</u>	/indow <u>H</u> e	»lp			
					A	XXX		: 750.0 750.0	100000 M 51.109 100000 M	Hz pF Hz	50. -4.1 41.7 -7	640 Ω 521 Ω 09 mU 3.869 °
	Ch1: St	Ch 1 Avg = at 550.000 (20 MHz			·····					Stop 950).000 MHz
10. 5.0 -5.0 -10 -15 -20 -25 -30 -35 -30 -40	00 10 10 100 1.00 1.00 1.00 1.00 1.00 1.00 Ch11: St	69.211 <u>Ch 1 Avg =</u> art 550.000	20 MHz				> 1	: 750.0		Hz	-27.	595 dB
S	atus	CH 1· 1	511		C* 1-Port		Ava=20 D	elay			L	CL



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Tel. +1.410.290.6652 / Fax +1.410.290.6654 http://www.pctest.com



Certification of Calibration

Object

D750V3 – SN:1161

Calibration procedure(s) Procedure for Calibration Extension for SAR Dipoles.

Extended Calibration date: October 18, 2019

Description: SAR Validation Dipole at 750 MHz.

Calibration Equipment used:

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Control Company	4040	Therm./Clock/Humidity Monitor	6/29/2019	Biennial	6/29/2021	192291470
Control Company	4352	Ultra Long Stem Thermometer	8/2/2018	Biennial	8/2/2020	181334684
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	433971
Narda	4772-3	Attenuator (3dB)	CBT	N/A	CBT	9406
Keysight Technologies	85033E	Standard Mechanical Calibration Kit (DC to 9GHz, 3.5mm)	7/2/2019	Annual	7/2/2020	MY53401181
Rohde & Schwarz	ZNLE6	Vector Network Analyzer	10/11/2019	Annual	10/11/2020	101307
Mini-Circuits	BW-N20W5+	DC to 18 GHz Precision Fixed 20 dB Attenuator	CBT	N/A	CBT	N/A
SPEAG	DAKS-3.5	Portable Dielectric Assessment Kit	8/13/2019	Annual	8/13/2020	1041
Anritsu	MA2411B	Pulse Power Sensor	8/14/2019	Annual	8/14/2020	1315051
Anritsu	MA2411B	Pulse Power Sensor	8/8/2019	Annual	8/8/2020	1339008
Anritsu	ML2495A	Power Meter	11/20/2018	Annual	11/20/2019	1039008
Agilent	N5182A	MXG Vector Signal Generator	8/19/2019	Annual	8/19/2020	MY47420837
Seekonk	NC-100	Torque Wrench	5/9/2018	Biennial	5/9/2020	22217
Mini-Circuits	NLP-2950+	Low Pass Filter DC to 2700 MHz	CBT	N/A	CBT	N/A
MiniCircuits	ZHDC-16-63-S+	Bidirectional Coupler	CBT	N/A	CBT	N/A
MiniCircuits	VLF-6000+	Low Pass Filter	CBT	N/A	CBT	N/A
SPEAG	EX3DV4	SAR Probe	4/24/2019	Annual	4/24/2020	7357
SPEAG	EX3DV4	SAR Probe	7/16/2019	Annual	7/16/2020	7410
SPEAG	DAE4	Dasy Data Acquisition Electronics	7/11/2019	Annual	7/11/2020	1322
SPEAG	DAE4	Dasy Data Acquisition Electronics	4/18/2019	Annual	4/18/2020	1407

Note: CBT (Calibrated Before Testing). Prior to testing, the measurement paths containing a cable, amplifier, attenuator, coupler or filter were connected to a calibrated source (i.e. a signal generator) to determine the losses of the measurement path.

Measurement Uncertainty = $\pm 23\%$ (k=2)

	Name	Function	Signature
Calibrated By:	Brodie Halbfoster	Team Lead Engineer	BRODIE HALBFOSTER
Approved By:	Kaitlin O'Keefe	Senior Technical Manager	XOK

Object:	Date Issued:	Page 1 of 4	
D750V3 – SN:1161	10/18/2019	raye 1014	

DIPOLE CALIBRATION EXTENSION

Per KDB 865664 D01, calibration intervals of up to three years may be considered for reference dipoles when it is demonstrated that the SAR target, impedance and return loss of a dipole have remained stable according to the following requirements:

- 1. The measured SAR does not deviate more than 10% from the target on the calibration certificate.
- 2. The return-loss does not deviate more than 20% from the previous measurement and meets the required 20dB minimum return-loss requirement.
- 3. The measurement of real or imaginary parts of impedance does not deviate more than 5Ω from the previous measurement.

The following dipole was checked to pass the above 3 requirements to have 2-year calibration period from the calibration date:

Calibration Date	Extension Date	Certificate Electrical Delay (ns)	Certificate SAR Target Head (1g) W/kg @ 23.0 dBm	Measured Head SAR (1g) W/kg @ 23.0 dBm	Deviation 1g (%)	Certificate SAR Target Head (10g) W/kg @ 23.0 dBm	Measured Head SAR (10g) W/kg @ 23.0 dBm	Deviation 10g (%)	Certificate Impedance Head (Ohm) Real	Measured Impedance Head (Ohm) Real	Difference (Ohm) Real	Certificate Impedance Head (Ohm) Imaginary	Measured Impedance Head (Ohm) Imaginary	Difference (Ohm) Imaginary	Certificate Return Loss Head (dB)	Measured Return Loss Head (dB)	Deviation (%)	PASS/FAIL
10/19/2018	10/18/2019	1.032	1.61	1.64	2.12%	1.05	1.08	2.66%	55.6	53.2	2.4	-1.9	-3.4	1.5	-25	-26.8	-7.30%	PASS
			Certificate			Certificate												
Calibration Date	Extension Date	Certificate Electrical Delay (ns)	SAR Target Body (1g) W/kg @ 23.0 dBm	Measured Body SAR (1g) W/kg @ 23.0 dBm	Deviation 1g (%)	SAR Target Body (10g) W/kg @ 23.0 dBm	Measured Body SAR (10g) W/kg @ 23.0 dBm	Deviation 10g (%)	Certificate Impedance Body (Ohm) Real	Measured Impedance Body (Ohm) Real	Difference (Ohm) Real	Certificate Impedance Body (Ohm) Imaginary	Measured Impedance Body (Ohm) Imaginary	Difference (Ohm) Imaginary	Certificate Return Loss Body (dB)	Measured Return Loss Body (dB)	Deviation (%)	PASS/FAIL

Object:	Date Issued:	Page 2 of 4	
D750V3 – SN:1161	10/18/2019	Fage 2 014	

Impedance & Return-Loss Measurement Plot for Head TSL



15:34:00 18.10.2019

Object:	Date Issued:	Page 3 of 4	
D750V3 – SN:1161	10/18/2019	raye 5 01 4	

Impedance & Return-Loss Measurement Plot for Body TSL



15:35:04 18.10.2019

Object:	Date Issued:	Page 4 of 4	
D750V3 – SN:1161	10/18/2019	Fage 4 01 4	

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Accreditation No.: SCS 0108

Client PC Test Certificate No: D835V2-4d047 Mar19

CALIBRATION CERTIFICATE

Object	D835V2 - SN:4d0	047						
Calibration procedure(s)	ibration procedure(s) QA CAL-05.v11 Calibration Procedure for SAR Validation Sources between 0.7-3 GHz							
			RN					
Calibration date:	March 13, 2019		04-12-2019					
This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate. All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.								
Calibration Equipment used (M&TE	critical for calibration)							
Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration					
Power meter NRP	SN: 104778	04-Apr-18 (No. 217-02672/02673)	Apr-19					
Power sensor NRP-Z91	SN: 103244	04-Apr-18 (No. 217-02672)	Apr-19					
Power sensor NRP-Z91	SN: 103245	04-Apr-18 (No. 217-02673)	Apr-19					
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-18 (No. 217-02682)	Apr-19					
Type-N mismatch combination	SN: 5047.2 / 06327	04-Apr-18 (No. 217-02683)	Apr-19					
Reference Probe EX3DV4	SN: 7349	31-Dec-18 (No. EX3-7349_Dec18)	Dec-19					
DAE4	SN: 601	04-Oct-18 (No. DAE4-601_Oct18)	Oct-19					
Secondary Standards	ID #	Check Date (in house)	Scheduled Check					
Power meter E4419B	SN: GB39512475	07-Oct-15 (in house check Feb-19)	In house check: Oct-20					
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-18)	in house check: Oct-20					
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-18)	In house check: Oct-20					
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-18)	In house check: Oct-20					
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-18)	In house check: Oct-19					
	Name	Function	Signature					
Calibrated by:	Manu Seitz	Laboratory Technician						
Approved by:	Katja Pokovic	Technical Manager	RAG					
This calibration contificate shall not	he reproduced event in	full without writton approval of the laborator	lssued: March 13, 2019					

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Accreditation No.: SCS 0108

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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:

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

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- Measurement Conditions: Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL: The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- Feed Point Impedance and Return Loss: These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- SAR measured: SAR measured at the stated antenna input power. •
- SAR normalized: SAR as measured, normalized to an input power of 1 W at the antenna • connector.
- SAR for nominal TSL parameters: The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Measurement Conditions

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

DASY Version	DASY5	V52.10.2
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	····
Frequency	835 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	41.9 ± 6 %	0.91 mho/m ± 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	2.37 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	9.42 W/kg ± 17.0 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.54 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	6.13 W/kg ± 16.5 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	55.2	0.97 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	54.3 ± 6 %	1.01 mho/m ± 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	2.45 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	9.47 W/kg ± 17.0 % (k=2)

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.61 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	6.27 W/kg ± 16.5 % (k=2)

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.4 Ω - 2.6 jΩ
Return Loss	- 30.7 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	46.8 Ω - 6.1 jΩ
Return Loss	- 22.9 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.387 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by SPEAG

DASY5 Validation Report for Head TSL

Date: 13.03.2019

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d047

Communication System: UID 0 - CW; Frequency: 835 MHz Medium parameters used: f = 835 MHz; σ = 0.91 S/m; ϵ_r = 41.9; ρ = 1000 kg/m³ Phantom section: Flat Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 SN7349; ConvF(10, 10, 10) @ 835 MHz; Calibrated: 31.12.2018
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.10.2018
- Phantom: Flat Phantom 4.9 (front); Type: QD 00L P49 AA; Serial: 1001
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mmReference Value = 62.48 V/m; Power Drift = -0.08 dB Peak SAR (extrapolated) = 3.60 W/kg SAR(1 g) = 2.37 W/kg; SAR(10 g) = 1.54 W/kg Maximum value of SAR (measured) = 3.18 W/kg



0 dB = 3.18 W/kg = 5.02 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 13.03.2019

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d047

Communication System: UID 0 - CW; Frequency: 835 MHz Medium parameters used: f = 835 MHz; $\sigma = 1.01$ S/m; $\varepsilon_r = 54.3$; $\rho = 1000$ kg/m³ Phantom section: Flat Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 SN7349; ConvF(10.15, 10.15, 10.15) @ 835 MHz; Calibrated: 31.12.2018
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.10.2018
- Phantom: Flat Phantom 4.9 (Back); Type: QD 00R P49 AA; Serial: 1005
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mmReference Value = 60.49 V/m; Power Drift = -0.02 dB Peak SAR (extrapolated) = 3.58 W/kg SAR(1 g) = 2.45 W/kg; SAR(10 g) = 1.61 W/kg Maximum value of SAR (measured) = 3.23 W/kg



0 dB = 3.23 W/kg = 5.09 dBW/kg

Impedance Measurement Plot for Body TSL



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



Schweizerischer Kalibrierdienst S

- Service suisse d'étalonnage С
 - Servizio svizzero di taratura
- S Swiss Calibration Service

Accreditation No.: SCS 0108

Accredited by the Swiss Accreditation Service (SAS) The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Client PC Test		C	Certificate No: D835V2-4d132_Jan20
CALIBRATION C	ERTIFICATE		
Object	D835V2 - SN:4d	132	
Calibration procedure(s)	QA CAL-05.v11 Calibration Proce	dure for SAR Validatio	n Sources between 0.7-3 GHz
Calibration date:	January 13, 2020)	BN 205-202
This callbration certificate documen The measurements and the uncert	nts the traceability to nati ainties with confidence p	ional standards, which realize th robability are given on the follov	ne physical units of measurements (SI). wing pages and are part of the certificate.
All calibrations have been conducted	ed in the closed laborato	ry facility: environment temperat	ture (22 \pm 3)°C and humidity < 70%.
Calibration Equipment used (M&TE	E critical for calibration)		
Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	03-Apr-19 (No. 217-02892/02	2893) Apr-20
Power sensor NRP-Z91	SN: 103244	03-Apr-19 (No. 217-02892)	Apr-20
Power sensor NRP-Z91	SN: 103245	03-Apr-19 (No. 217-02893)	Apr-20
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-19 (No. 217-02894)	Apr-20
Type-N mismatch combination	SN: 5047.2 / 06327	04-Apr-19 (No. 217-02895)	Apr-20
Reference Probe EX3DV4	SN: 7349	31-Dec-19 (No. EX3-7349 D	bec19) Dec-20
DAE4	SN: 601	27-Dec-19 (No. DAE4-601_D	Dec19) Dec-20
Secondary Standards	ID#	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB39512475	30-Oct-14 (in house check Fe	eb-19) In house check: Oct-20
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check O	Ct-18) In house check: Oct-20
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check O	Oct-18) In house check: Oct-20
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check O	Oct-18) In house check: Oct-20
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check C	Oct-19) In house check: Oct-20
	Name	Function	Signature
Calibrated by:	Leif Klysher	Laboratory lech	nician Saf Mign
Approved by:	Katja Pokovic	Technical Manaç	ger MG
This calibration certificate shall not	be reproduced except in	full without written approval of I	Issued: January 21, 2020 the laboratory.

Calibration Laboratory of

Schmid & Partner Engineering AG Zeughausstrasse 43, 8004 Zurich, Switzerland





Schweizerischer Kalibrierdienst

S Service suisse d'étalonnage

С Servizio svizzero di taratura

S **Swiss Calibration Service**

Accredited by the Swiss Accreditation Service (SAS) The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- Measurement Conditions: Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL: The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- Feed Point Impedance and Return Loss: These parameters are measured with the dipole • positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- Electrical Delay: One-way delay between the SMA connector and the antenna feed point. 0 No uncertainty required.
- SAR measured: SAR measured at the stated antenna input power. ø
- 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%.

Accreditation No.: SCS 0108

Measurement Conditions

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

DASY Version	DASY5	V52.10.3
Extrapolation	Advanced Extrapolation	• • • •
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	42.6 ± 6 %	0.91 mho/m ± 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	2.42 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	9.65 W/kg ± 17.0 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.58 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	6.30 W/kg ± 16.5 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	55.2	0.97 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	55.1 ± 6 %	0.99 mho/m ± 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	2.53 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	9.96 W/kg ± 17.0 % (k=2)

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.68 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	6.64 W/kg ± 16.5 % (k=2)

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	50.4 Ω - 3.1 jΩ
Return Loss	- 30.0 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	48.7 Ω - 5.5 jΩ
Return Loss	- 24.8 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.385 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
-	

DASY5 Validation Report for Head TSL

Date: 13.01.2020

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d132

Communication System: UID 0 - CW; Frequency: 835 MHz Medium parameters used: f = 835 MHz; $\sigma = 0.91$ S/m; $\epsilon_r = 42.6$; $\rho = 1000$ kg/m³ Phantom section: Flat Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 SN7349; ConvF(9.89, 9.89, 9.89) @ 835 MHz; Calibrated: 31.12.2019
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.12.2019
- Phantom: Flat Phantom 4.9 (front); Type: QD 00L P49 AA; Serial: 1001
- DASY52 52.10.3(1513); SEMCAD X 14.6.13(7474)

Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mmReference Value = 62.94 V/m; Power Drift = -0.02 dB Peak SAR (extrapolated) = 3.60 W/kg SAR(1 g) = 2.42 W/kg; SAR(10 g) = 1.58 W/kg Smallest distance from peaks to all points 3 dB below = 16 mm Ratio of SAR at M2 to SAR at M1 = 67.1% Maximum value of SAR (measured) = 3.20 W/kg



0 dB = 3.20 W/kg = 5.05 dBW/kg