

Annex A. SAR Plots of System Verification

The plots for system verification are shown as follows.

S01 System Check_H2450_211027

DUT: Dipole 2450 MHz; Type: D2450V2; SN: 835

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

Medium: H19T27N1_1027 Medium parameters used (interpolated): $f = 2450$ MHz; $\sigma = 1.879$ S/m; $\epsilon_r = 39.289$; $\rho = 1000$ kg/m³

Ambient Temperature : 23.5 °C; Liquid Temperature : 23.3 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN7537; ConvF(7.61, 7.61, 7.61) @ 2450 MHz; Calibrated: 2021/04/26
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1585; Calibrated: 2021/04/15
- Phantom: ELI Phantom_2118; Type: QD OVA 004 AA;
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Pin=50mW/Area Scan (81x81x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm

Maximum value of SAR (interpolated) = 4.13 W/kg

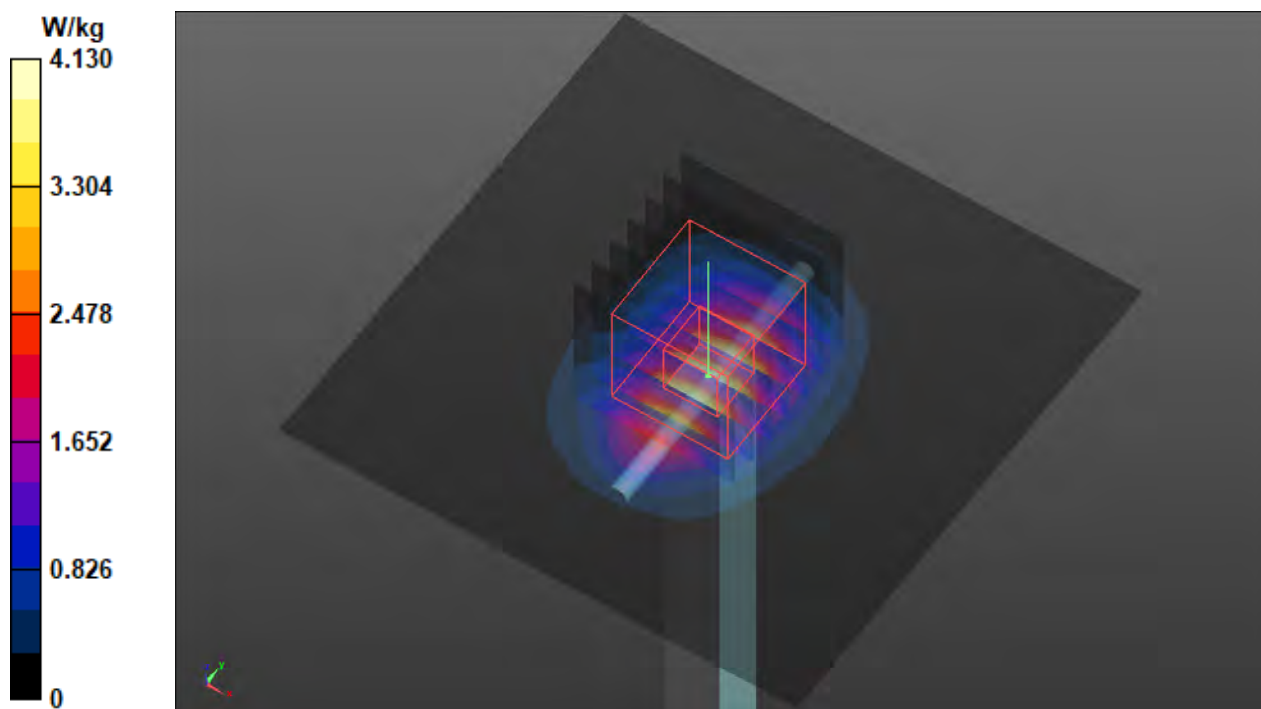
Pin=50mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 48.13 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 5.22 W/kg

SAR(1 g) = 2.47 W/kg; SAR(10 g) = 1.17 W/kg (SAR corrected for target medium)

Maximum value of SAR (measured) = 4.23 W/kg



S02 System Check_H5250_211026

DUT: Dipole 5 GHz; Type: D5GHzV2; SN: 1019

Communication System: UID 0, CW; Frequency: 5250 MHz; Duty Cycle: 1:1

Medium: H34T60N1_1026 Medium parameters used: $f = 5250$ MHz; $\sigma = 4.799$ S/m; $\epsilon_r = 35.398$; $\rho = 1000$ kg/m³

Ambient Temperature : 23.6 °C ; Liquid Temperature : 23.3 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN7554; ConvF(5.1, 5.1, 5.1) @ 5250 MHz; Calibrated: 2021/08/26
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1589; Calibrated: 2021/08/20
- Phantom: ELI Phantom_2105; Type: QD OVA 004 Ax;
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Pin=50mW/Area Scan (91x91x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 9.10 W/kg

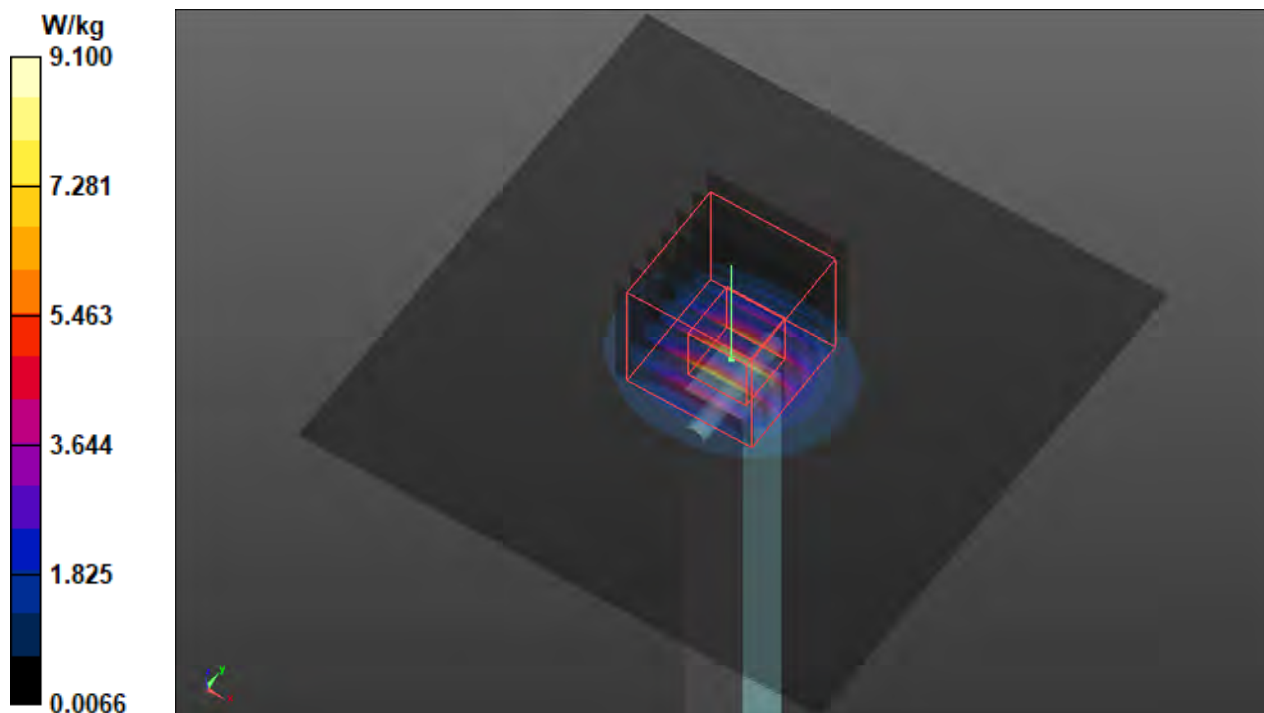
Pin=50mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 49.37 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 15.0 W/kg

SAR(1 g) = 3.92 W/kg; SAR(10 g) = 1.13 W/kg (SAR corrected for target medium)

Maximum value of SAR (measured) = 9.67 W/kg



S03 System Check_H5750_211026

DUT: Dipole 5 GHz; Type: D5GHzV2; SN: 1019

Communication System: UID 0, CW; Frequency: 5750 MHz; Duty Cycle: 1:1

Medium: H34T60N1_1026 Medium parameters used: $f = 5750$ MHz; $\sigma = 5.337$ S/m; $\epsilon_r = 34.453$; $\rho = 1000$ kg/m³

Ambient Temperature : 23.6 °C ; Liquid Temperature : 23.3 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN7554; ConvF(4.8, 4.8, 4.8) @ 5750 MHz; Calibrated: 2021/08/26
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1589; Calibrated: 2021/08/20
- Phantom: ELI Phantom_2105; Type: QD OVA 004 Ax;
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Pin=50mW/Area Scan (91x91x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 8.86 W/kg

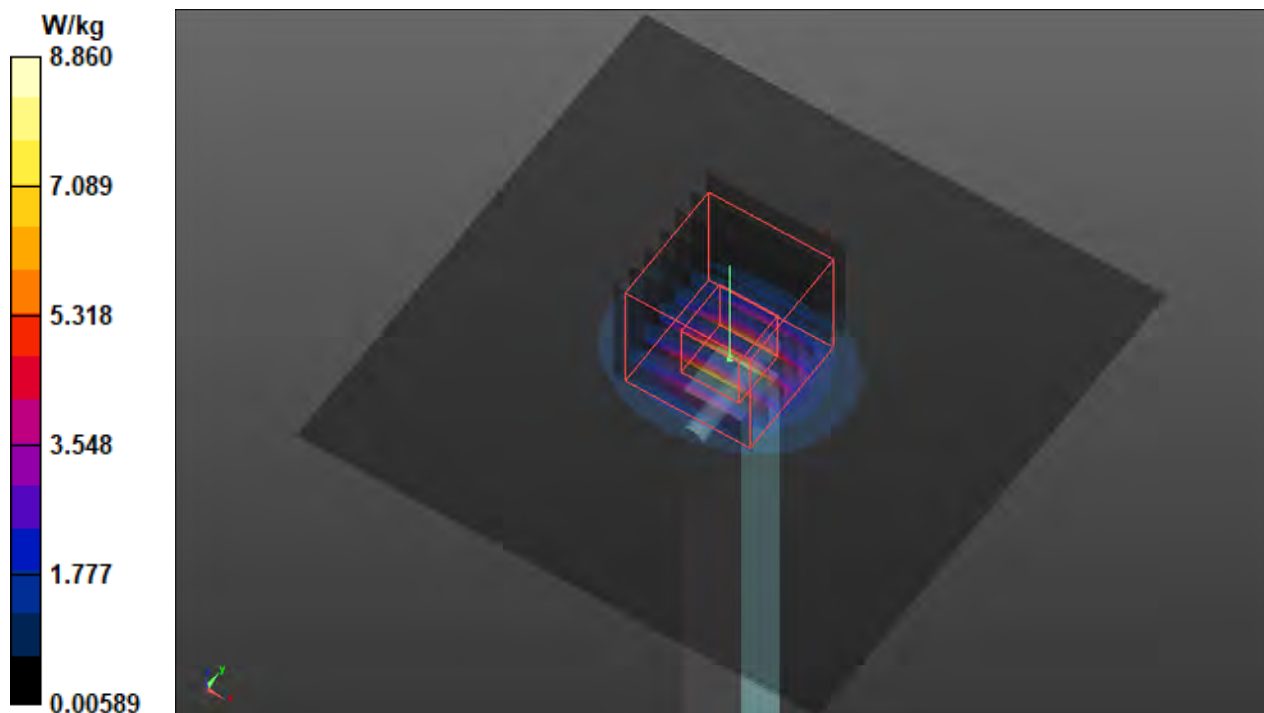
Pin=50mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 45.92 V/m; Power Drift = 0.09 dB

Peak SAR (extrapolated) = 16.1 W/kg

SAR(1 g) = 3.66 W/kg; SAR(10 g) = 1.04 W/kg (SAR corrected for target medium)

Maximum value of SAR (measured) = 9.57 W/kg



S04 System Check_H2450_211027**DUT: Dipole 2450 MHz; Type: D2450V2; SN: 835**

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

Medium: H19T27N1_1027 Medium parameters used (interpolated): $f = 2450$ MHz; $\sigma = 1.879$ S/m; $\epsilon_r = 39.289$; $\rho = 1000$ kg/m³

Ambient Temperature : 23.5 °C; Liquid Temperature : 23.3 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN7537; ConvF(7.61, 7.61, 7.61) @ 2450 MHz; Calibrated: 2021/04/26
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1585; Calibrated: 2021/04/15
- Phantom: ELI Phantom_2118; Type: QD OVA 004 AA;
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Pin=50mW/Area Scan (81x81x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm

Maximum value of SAR (interpolated) = 4.13 W/kg

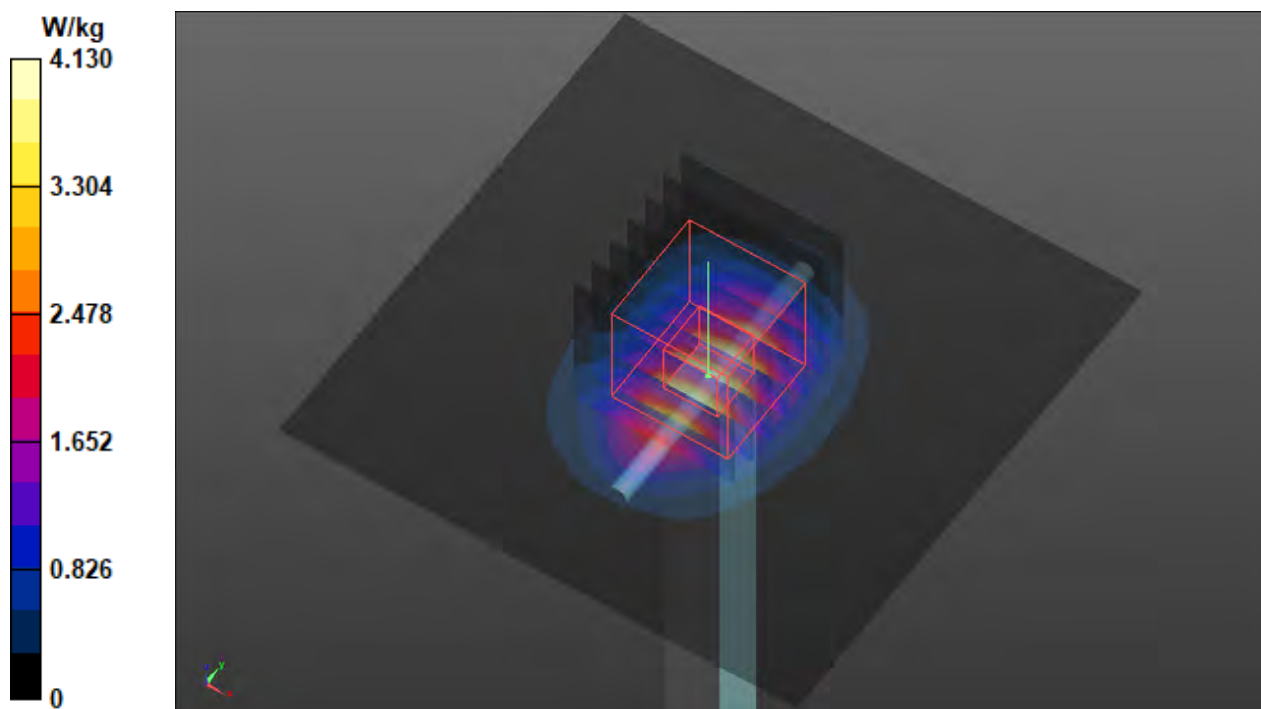
Pin=50mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 48.13 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 5.22 W/kg

SAR(1 g) = 2.47 W/kg; SAR(10 g) = 1.17 W/kg (SAR corrected for target medium)

Maximum value of SAR (measured) = 4.23 W/kg



Annex B. SAR Plots of SAR Measurement

The SAR plots for highest measured SAR in each exposure configuration, wireless mode and frequency band combination are shown as follows.

P01 WLAN2.4G_802.11b_Rear Face_0mm_Ch6_Sample_Kingston_Holster_w_o_Ant 0

DUT: WTW-P21080520

Communication System: UID 10012 - CAB, IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps);

Frequency: 2437 MHz; Duty Cycle: 1:1.03

Medium: H19T27N1_1027 Medium parameters used (interpolated): $f = 2437$ MHz; $\sigma = 1.864$ S/m;

$\epsilon_r = 39.32$; $\rho = 1000$ kg/m³

Ambient Temperature : 23.5 °C; Liquid Temperature : 23.3 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN7537; ConvF(7.61, 7.61, 7.61) @ 2437 MHz; Calibrated: 2021/04/26
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1585; Calibrated: 2021/04/15
- Phantom: ELI Phantom_2118; Type: QD OVA 004 AA;
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Area Scan (171x151x1): Interpolated grid: $dx=1.200$ mm, $dy=1.200$ mm

Maximum value of SAR (interpolated) = 0.985 W/kg

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

Reference Value = 23.18 V/m; Power Drift = -0.14 dB

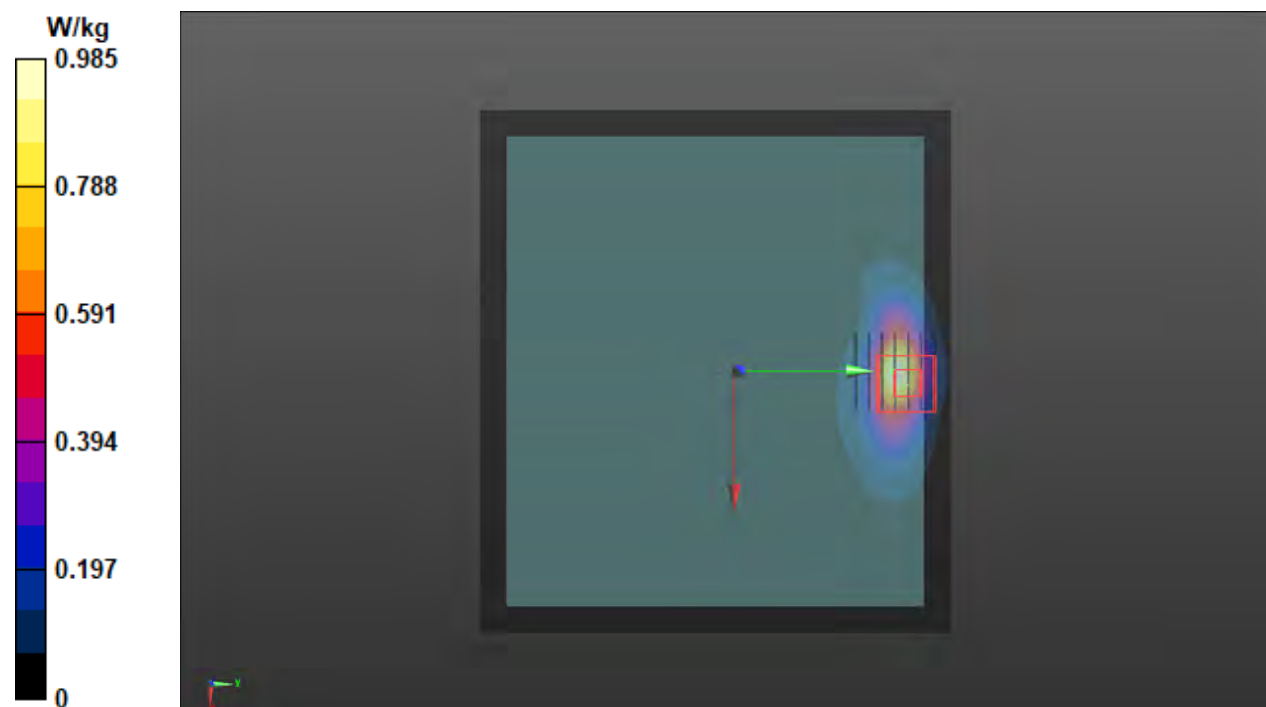
Peak SAR (extrapolated) = 2.73 W/kg

SAR(1 g) = 0.853 W/kg; SAR(10 g) = 0.315 W/kg (SAR corrected for target medium)

Smallest distance from peaks to all points 3 dB below = 5.5 mm

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

Maximum value of SAR (measured) = 1.83 W/kg



**P02 WLAN5.2G_802.11ac VHT40_Rear
Face_0mm_Ch38_Sample_Kingston_Holster_w_o_Ant 0****DUT: WTW-P21080520**

Communication System: UID 10534 - AAC, IEEE 802.11ac WiFi (40MHz, MCS0); Frequency: 5190 MHz; Duty Cycle: 1:1.06

Medium: H34T60N1_1026 Medium parameters used: $f = 5190$ MHz; $\sigma = 4.719$ S/m; $\epsilon_r = 35.478$; $\rho = 1000$ kg/m³

Ambient Temperature : 23.6 °C ; Liquid Temperature : 23.3 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN7554; ConvF(5.1, 5.1, 5.1) @ 5190 MHz; Calibrated: 2021/08/26
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1589; Calibrated: 2021/08/20
- Phantom: ELI Phantom_2105; Type: QD OVA 004 Ax;
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Area Scan (201x181x1): Interpolated grid: $dx=1.000$ mm, $dy=1.000$ mm

Maximum value of SAR (interpolated) = 1.24 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=4$ mm, $dy=4$ mm, $dz=1.4$ mm

Reference Value = 17.51 V/m; Power Drift = -0.05 dB

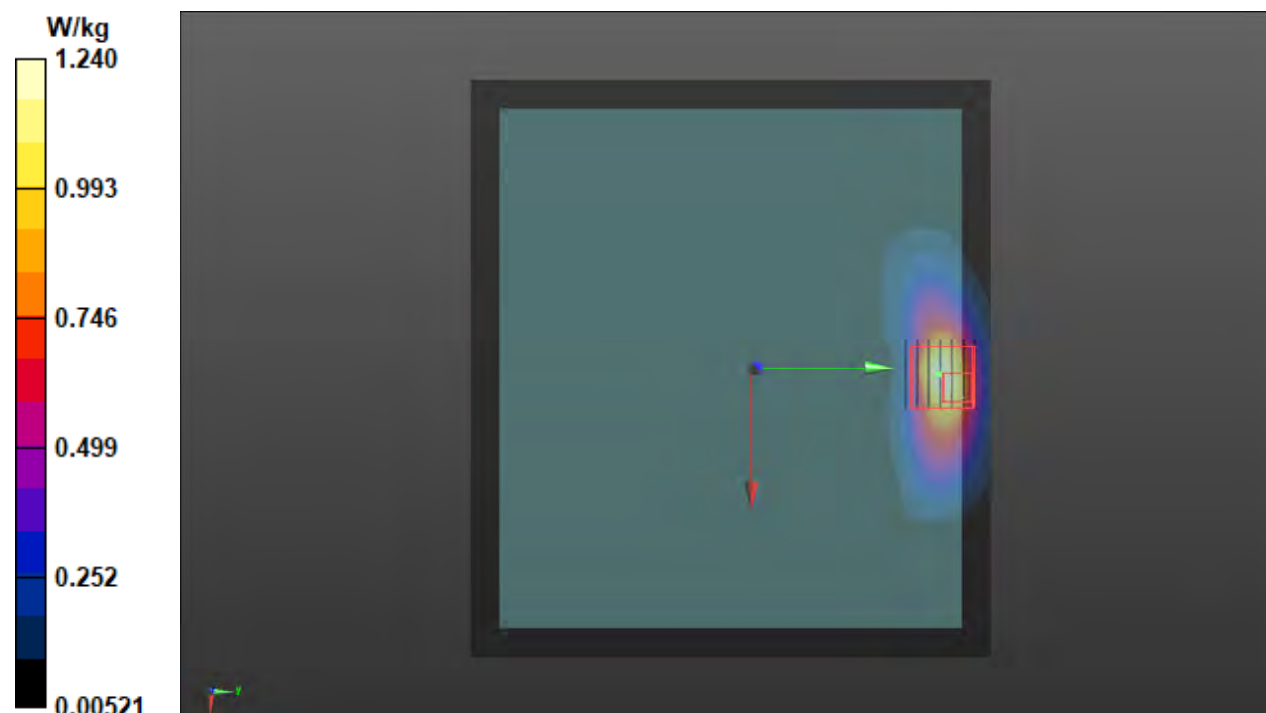
Peak SAR (extrapolated) = 5.32 W/kg

SAR(1 g) = 1.07 W/kg; SAR(10 g) = 0.308 W/kg (SAR corrected for target medium)

Smallest distance from peaks to all points 3 dB below = 4.7 mm

Ratio of SAR at M2 to SAR at M1 = 59.7%

Maximum value of SAR (measured) = 2.86 W/kg



**P03 WLAN5.8G_802.11ac VHT40_Right
Side_0mm_Ch151_Sample_Kingston_Holster_w_o_Ant 0****DUT: WTW-P21080520**

Communication System: UID 10534 - AAC, IEEE 802.11ac WiFi (40MHz, MCS0); Frequency: 5755 MHz; Duty Cycle: 1:1.06

Medium: H34T60N1_1026 Medium parameters used: $f = 5755$ MHz; $\sigma = 5.348$ S/m; $\epsilon_r = 34.442$; $\rho = 1000$ kg/m³

Ambient Temperature : 23.6 °C ; Liquid Temperature : 23.3 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN7554; ConvF(4.8, 4.8, 4.8) @ 5755 MHz; Calibrated: 2021/08/26
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1589; Calibrated: 2021/08/20
- Phantom: ELI Phantom_2105; Type: QD OVA 004 Ax;
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Area Scan (81x221x1): Interpolated grid: $dx=1.000$ mm, $dy=1.000$ mm

Maximum value of SAR (interpolated) = 2.34 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=4$ mm, $dy=4$ mm, $dz=1.4$ mm

Reference Value = 23.05 V/m; Power Drift = 0.09 dB

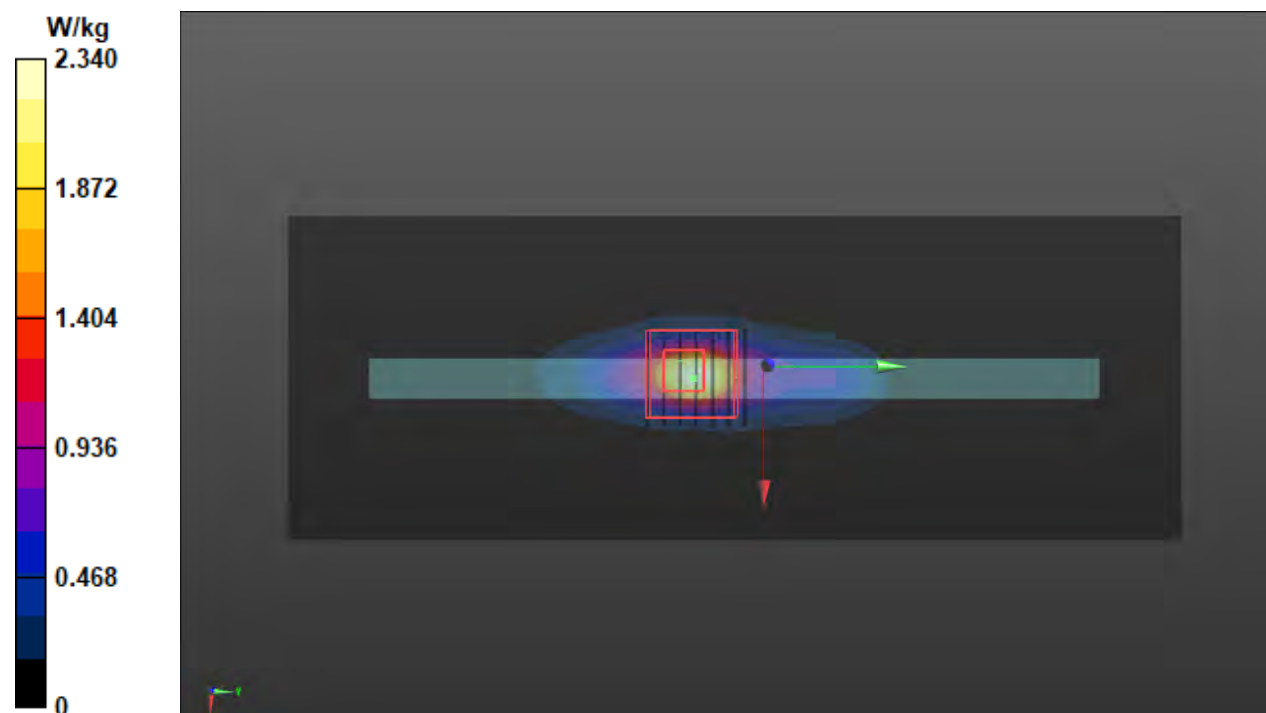
Peak SAR (extrapolated) = 4.73 W/kg

SAR(1 g) = 0.947 W/kg; SAR(10 g) = 0.264 W/kg (SAR corrected for target medium)

Smallest distance from peaks to all points 3 dB below = 4.9 mm

Ratio of SAR at M2 to SAR at M1 = 60.3%

Maximum value of SAR (measured) = 2.40 W/kg



P04 BT_BDR_Rear Face_0mm_Ch78_Sample_MK_Holster_w_o_Ant 0**DUT: WTW-P21080520**

Communication System: UID 10032 - CAA, IEEE 802.15.1 Bluetooth (GFSK, DH5); Frequency: 2480 MHz; Duty Cycle: 1:1.32

Medium: H19T27N1_1027 Medium parameters used: $f = 2480$ MHz; $\sigma = 1.909$ S/m; $\epsilon_r = 39.209$; $\rho = 1000$ kg/m³

Ambient Temperature : 23.5 °C; Liquid Temperature : 23.3 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN7537; ConvF(7.61, 7.61, 7.61) @ 2480 MHz; Calibrated: 2021/04/26
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1585; Calibrated: 2021/04/15
- Phantom: ELI Phantom_2118; Type: QD OVA 004 AA;
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Area Scan (171x151x1): Interpolated grid: $dx=1.200$ mm, $dy=1.200$ mm

Maximum value of SAR (interpolated) = 0.121 W/kg

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

Reference Value = 8.253 V/m; Power Drift = -0.05 dB

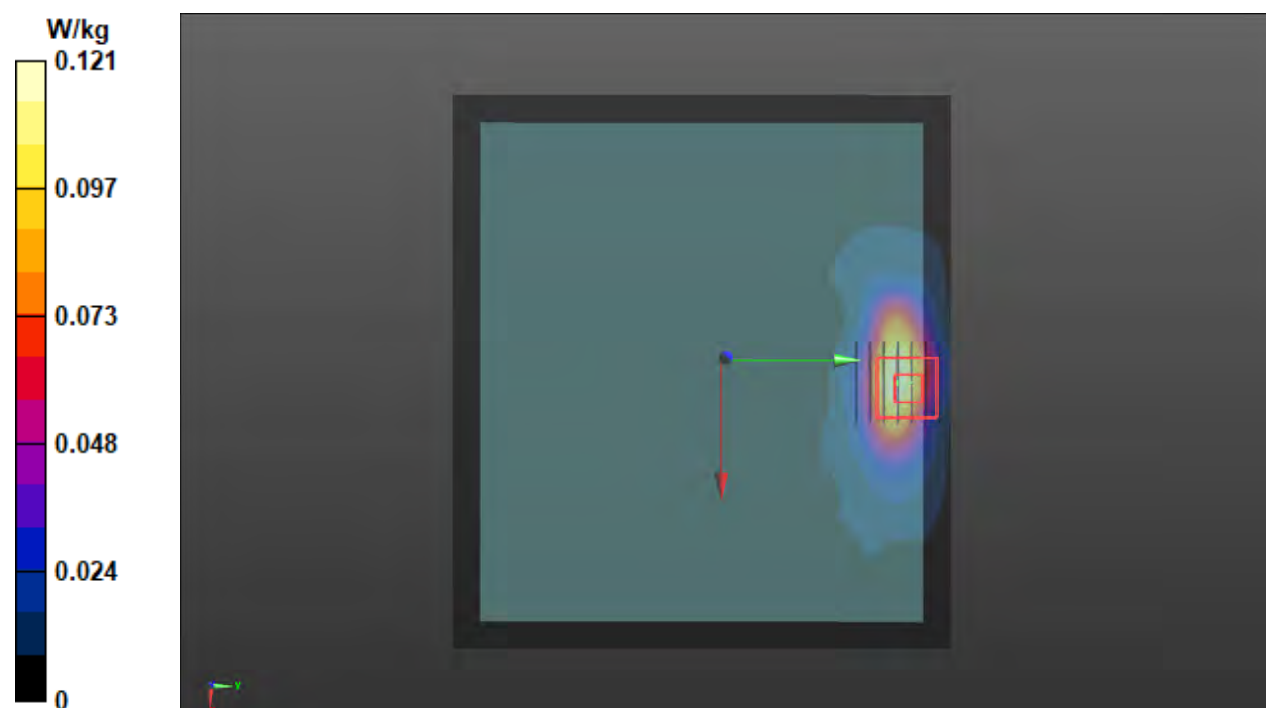
Peak SAR (extrapolated) = 0.501 W/kg

SAR(1 g) = 0.211 W/kg; SAR(10 g) = 0.08 W/kg (SAR corrected for target medium)

Smallest distance from peaks to all points 3 dB below = 5.5 mm

Ratio of SAR at M2 to SAR at M1 = 56.2%

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



Annex C. Tissue & System Verification

The measuring results for tissue simulating liquid and system check are shown as below.

Note:

1. For Section 4.3, the dielectric properties of the tissue simulating liquid have been measured within 24 hours before the SAR testing and within ± 10 % of the target values. Liquid temperature during the SAR testing has kept within ± 2 °C.
2. For Section 4.4, The SAR measurement system was validated according to procedures in KDB 865664 D01. The validation status in tabulated summary is as below.
3. For Section 4.5, Comparing to the reference SAR value provided by SPEAG in dipole calibration certificate, the deviation of system check results is within its specification of 10 %. The result indicates the system check can meet the variation criterion and the plots please refer to Annex A of this report.

Tissue Verification									Validation for CW			Validation for Modulation				System Validation					Note			
Plot No.	Frequency (MHz)	Liquid Temp. (°C)	Conductivity (σ)	Permittivity (ε _r)	Targeted Conductivity (σ)	Targeted Permittivity (ε _r)	Deviation Conductivity (σ)	Deviation Permittivity (ε _r)	Sensitivity Range	Probe Linearity	Probe Isotropy	Modulation Type	Duty Factor	PAR	Date	Frequency (MHz)	Targeted 1g SAR (W/kg)	Measured 1g SAR (W/kg)	Normalized 1g SAR (W/kg)	Deviation (%)	Dipole S/N	Probe S/N	DAE S/N	Output Power (dB)
S01	2450	23.3	1.879	39.289	1.8	39.2	4.39	0.23	Pass	Pass	Pass	OFDM	N/A	Pass	Oct. 27, 2021	2450	52.70	2.47	49.28	-6.48	835	7537	1585	17
S02	5250	23.3	4.799	35.398	4.71	35.9	1.89	-1.40	Pass	Pass	Pass	OFDM	N/A	Pass	Oct. 26, 2021	5250	80.60	3.92	78.21	-2.96	1019	7554	1589	17
S03	5750	23.3	5.337	34.453	5.22	35.4	2.24	-2.68	Pass	Pass	Pass	OFDM	N/A	Pass	Oct. 26, 2021	5750	79.40	3.66	73.03	-8.03	1019	7554	1589	17
S04	2450	23.3	1.879	39.289	1.8	39.2	4.39	0.23	Pass	Pass	Pass	OFDM	N/A	Pass	Oct. 27, 2021	2450	52.70	2.47	49.28	-6.48	835	7537	1585	17

Annex D. Maximum Target Conducted Power

The maximum conducted average power (Unit: dBm) including tune-up tolerance is shown as below.

WLAN Tune-up Power (Full)			
WLAN 2.4GHz			
Mode	Channel	Frequency	SISO Ant 0 Max Tune up
802.11b	1	2412	12.0
	6	2437	12.0
	11	2462	12.0
802.11g	1	2412	12.0
	6	2437	12.0
	11	2462	12.0
802.11n HT20	1	2412	11.5
	6	2437	11.5
	11	2462	11.5

WLAN Tune-up Power (Full)			
Bluetooth			
Mode	Channel	Frequency	Ant 0 Max Tune-up
BR / EDR	0	2402	5.0
	39	2441	5.0
	78	2480	5.0
LE	0	2402	5.0
	19	2440	5.0
	39	2480	5.0

WLAN Tune-up Power (Full)			
WLAN 5.2GHz			
Mode	Channel	Frequency	SISO Ant 0 Max Tune up
802.11a	36	5180	10.5
	40	5200	10.5
	44	5220	10.5
	48	5240	10.5
802.11ac VHT20	36	5180	10.5
	40	5200	10.5
	44	5220	10.5
	48	5240	10.5
802.11ac VHT40	38	5190	11.0
	46	5230	11.0
802.11ac VHT80	42	5210	10.5

WLAN Tune-up Power (Full)			
WLAN 5.8GHz			
Mode	Channel	Frequency	SISO Ant 0 Max Tune up
802.11a	149	5745	6.0
	153	5765	6.0
	157	5785	6.0
	161	5805	6.0
	165	5825	6.0
802.11ac VHT20	149	5745	6.0
	153	5765	6.0
	157	5785	6.0
	161	5805	6.0
	165	5825	6.0
802.11ac VHT40	151	5755	6.5
	159	5795	6.5
802.11ac VHT80	155	5775	6.0

Annex E. Measured Conducted Power Result

The measuring conducted power (Unit: dBm) are shown as below.

WLAN Conducted Power (Full)			
WLAN2.4GHz Ant 0			
Mode	Channel	Frequency	SISO Ant 0 Avg. Power
802.11b	1	2412	11.8
	6	2437	11.9
	11	2462	11.8
802.11g	1	2412	11.5
	6	2437	11.7
	11	2462	11.6
802.11n HT20	1	2412	11.4
	6	2437	11.4
	11	2462	11.3

WLAN Conducted Power (Full)			
Bluetooth Ant 0			
Mode	Channel	Frequency	SISO Ant 0 Avg. Power
BR / EDR	0	2402	4.6
	39	2441	4.3
	78	2480	4.1
LE	0	2402	4.2
	19	2440	4.5
	39	2480	4.3

WLAN Conducted Power (Full)			
WLAN 5.2GHz Ant 0			
Mode	Channel	Frequency	SISO Ant 0 Avg. Power
802.11a	36	5180	10.2
	40	5200	10.3
	44	5220	10.4
	48	5240	10.3
802.11ac VHT20	36	5180	10.3
	40	5200	10.3
	44	5220	10.5
	48	5240	10.4
802.11ac VHT40	38	5190	10.8
	46	5230	10.9
802.11ac VHT80	42	5210	10.2

WLAN Conducted Power (Full)			
WLAN 5.8GHz Ant 0			
Mode	Channel	Frequency	SISO Ant 0 Avg. Power
802.11a	149	5745	5.9
	153	5765	5.9
	157	5785	5.9
	161	5805	5.8
	165	5825	5.8
802.11ac VHT20	149	5745	5.9
	153	5765	5.9
	157	5785	5.8
	161	5805	5.8
	165	5825	5.9
802.11ac VHT40	151	5755	6.2
	159	5795	6.3
802.11ac VHT80	155	5775	5.7

Annex F. SAR Test Result

SAR Results for Body Exposure Condition.

Note:

1. SAR testing for WLAN was performed on the maximum power mode.
2. The “< 0.001” means there is no SAR value or the SAR is too low to be measured.

Body SAR Test Result

System & Position						DUT & Accessory		SAR							
Plot No.	Band	Mode	Test Position	Separation Distance (mm)	Channel	Sample	Holster	Duty Cycle	Crest Factor	Max. Tune-up Power (dBm)	Measured Conducted Power (dBm)	Scaling Factor	Power Drift (dB)	Measured SAR-1g (W/kg)	Scaled SAR-1g (W/kg)
1	WLAN2.4G	802.11b	Rear Face	0	6	Kingston	w/o	97.50	1.03	12.00	11.90	1.02	-0.14	0.853	0.90
	WLAN2.4G	802.11b	Left Side	0	6	Kingston	w/o	97.50	1.03	12.00	11.90	1.02	0	<0.001	0.00
	WLAN2.4G	802.11b	Right Side	0	6	Kingston	w/o	97.50	1.03	12.00	11.90	1.02	0.11	0.331	0.35
	WLAN2.4G	802.11b	Top Side	0	6	Kingston	w/o	97.50	1.03	12.00	11.90	1.02	0.09	0.049	0.05
	WLAN2.4G	802.11b	Bottom Side	0	6	Kingston	w/o	97.50	1.03	12.00	11.90	1.02	0	<0.001	0.00
	WLAN2.4G	802.11b	Rear Face	0	1	Kingston	w/o	97.50	1.03	12.00	11.80	1.05	0.01	0.732	0.79
	WLAN2.4G	802.11b	Rear Face	0	11	Kingston	w/o	97.50	1.03	12.00	11.80	1.05	0.14	0.718	0.78
	WLAN2.4G	802.11b	Rear Face	0	6	MK	w/o	97.50	1.03	12.00	11.90	1.02	-0.02	0.819	0.86
	WLAN2.4G	802.11b	Rear Face	0	1	MK	w/o	97.50	1.03	12.00	11.80	1.05	0.05	0.722	0.78
	WLAN2.4G	802.11b	Rear Face	0	11	MK	w/o	97.50	1.03	12.00	11.80	1.05	-0.14	0.708	0.77
	WLAN2.4G	802.11b	Rear Face	0	6	Kingston	w/	97.50	1.03	12.00	11.90	1.02	0.14	0.245	0.26
	WLAN2.4G	802.11b	Rear Face	0	6	Kingston	w/o	97.50	1.03	12.00	11.90	1.02	0.05	0.848	0.89
	WLAN5.2G	802.11ac VHT40	Rear Face	0	46	Kingston	w/o	94.40	1.06	11.00	10.90	1.02	-0.08	1.05	1.12
	WLAN5.2G	802.11ac VHT40	Left Side	0	46	Kingston	w/o	94.40	1.06	11.00	10.90	1.02	0	<0.001	0.00
	WLAN5.2G	802.11ac VHT40	Right Side	0	46	Kingston	w/o	94.40	1.06	11.00	10.90	1.02	-0.08	1.04	1.12
	WLAN5.2G	802.11ac VHT40	Top Side	0	46	Kingston	w/o	94.40	1.06	11.00	10.90	1.02	0	<0.001	0.00
	WLAN5.2G	802.11ac VHT40	Bottom Side	0	46	Kingston	w/o	94.40	1.06	11.00	10.90	1.02	0	<0.001	0.00
2	WLAN5.2G	802.11ac VHT40	Rear Face	0	38	Kingston	w/o	94.40	1.06	11.00	10.80	1.05	-0.05	1.07	1.19
	WLAN5.2G	802.11ac VHT40	Right Side	0	38	Kingston	w/o	94.40	1.06	11.00	10.80	1.05	-0.08	1.01	1.10
	WLAN5.2G	802.11ac VHT40	Rear Face	0	38	MK	w/o	94.40	1.06	11.00	10.80	1.05	0.14	0.894	0.98
	WLAN5.2G	802.11ac VHT40	Rear Face	0	46	MK	w/o	94.40	1.06	11.00	10.90	1.02	0.09	0.973	1.05
	WLAN5.2G	802.11ac VHT40	Rear Face	0	38	Kingston	w/	94.40	1.06	11.00	10.80	1.05	0.05	0.452	0.50
	WLAN5.2G	802.11ac VHT40	Rear Face	0	38	Kingston	w/o	94.40	1.06	11.00	10.80	1.05	0.08	1.05	1.17
	WLAN5.8G	802.11ac VHT40	Rear Face	0	159	Kingston	w/o	94.40	1.06	6.50	6.30	1.05	-0.05	0.672	0.75
	WLAN5.8G	802.11ac VHT40	Left Side	0	159	Kingston	w/o	94.40	1.06	6.50	6.30	1.05	0	<0.001	0.00
	WLAN5.8G	802.11ac VHT40	Right Side	0	159	Kingston	w/o	94.40	1.06	6.50	6.30	1.05	-0.04	0.857	0.95
	WLAN5.8G	802.11ac VHT40	Top Side	0	159	Kingston	w/o	94.40	1.06	6.50	6.30	1.05	0.05	0.03	0.03
	WLAN5.8G	802.11ac VHT40	Bottom Side	0	159	Kingston	w/o	94.40	1.06	6.50	6.30	1.05	0.09	0.027	0.03
3	WLAN5.8G	802.11ac VHT40	Right Side	0	151	Kingston	w/o	94.40	1.06	6.50	6.20	1.07	0.09	0.947	1.07
	WLAN5.8G	802.11ac VHT40	Right Side	0	159	MK	w/o	94.40	1.06	6.50	6.30	1.05	0.08	0.842	0.94
	WLAN5.8G	802.11ac VHT40	Right Side	0	151	MK	w/o	94.40	1.06	6.50	6.20	1.07	-0.01	0.924	1.05
	WLAN5.8G	802.11ac VHT40	Right Side	0	151	Kingston	w/	94.40	1.06	6.50	6.20	1.07	0.05	0.844	0.96
	WLAN5.8G	802.11ac VHT40	Right Side	0	151	Kingston	w/o	94.40	1.06	6.50	6.20	1.07	0.09	0.938	1.06

Body SAR Test Result

System & Position						DUT & Accessory		SAR							
Plot No.	Band	Mode	Test Position	Separation Distance (mm)	Channel	Sample	Holster	Duty Cycle	Crest Factor	Max. Tune-up Power (dBm)	Measured Conducted Power (dBm)	Scaling Factor	Power Drift (dB)	Measured SAR-1g (W/kg)	Scaled SAR-1g (W/kg)
	BT	BDR	Rear Face	0	0	Kingston	w/o	76.00	1.32	5.00	4.60	1.10	0.03	0.123	0.18
	BT	BDR	Left Side	0	0	Kingston	w/o	76.00	1.32	5.00	4.60	1.10	-0.19	<0.001	0.00
	BT	BDR	Right Side	0	0	Kingston	w/o	76.00	1.32	5.00	4.60	1.10	0.02	0.064	0.09
	BT	BDR	Top Side	0	0	Kingston	w/o	76.00	1.32	5.00	4.60	1.10	-0.15	<0.001	0.00
	BT	BDR	Bottom Side	0	0	Kingston	w/o	76.00	1.32	5.00	4.60	1.10	-0.11	<0.001	0.00
	BT	BDR	Rear Face	0	39	Kingston	w/o	76.00	1.32	5.00	4.30	1.17	0.17	0.179	0.28
	BT	BDR	Rear Face	0	78	Kingston	w/o	76.00	1.32	5.00	4.10	1.23	0.05	0.188	0.31
4	BT	BDR	Rear Face	0	78	MK	w/o	76.00	1.32	5.00	4.10	1.23	-0.05	0.211	0.34
	BT	BDR	Rear Face	0	78	MK	w/	76.00	1.32	5.00	4.10	1.23	-0.19	0.061	0.10

Annex G. SAR Measurement Variability

Since all the measured SAR_{1g} are less than 0.8 W/kg, the repeated measurement is not required.

SAR repeated measurement are shown as below.

Repeat SAR							
Plot	Band	Mode	Test Position	Ch.	Original Measured SAR-1g (W/kg)	1st Repeated SAR-1g (W/kg)	L/S Ratio
R01	WLAN2.4G	802.11b	Rear Face	6	0.853	0.848	1.01
R02	WLAN5.2G	802.11ac VHT40	Rear Face	38	1.07	1.05	1.02
R03	WLAN5.8G	802.11ac VHT40	Right Side	151	0.947	0.938	1.01

Annex H. Analysis of Simultaneous Transmission SAR.

The analysis of simultaneous transmission SAR are shown as below.

<Possibilities of Simultaneous Transmission>

The simultaneous transmission possibilities for this device are listed as below.

Simultaneous TX Combination	Capable Transmit Configurations	Body Exposure Condition
A	MAX WLAN 2.4G + BT	Yes
B	MAX WLAN 5G + BT	Yes

Notes

1. The WLAN 2.4G and WLAN 5G cannot transmit simultaneously.

Simultaneous Transmission SAR Evaluation (Body)					
Position	1	2	3	A(1+3)	B(2+3)
	Max WLAN 2.4GHz	Max WLAN 5GHz	BT Ant 0	Summimg result 1g SAR W/kg	Summimg result 1g SAR W/kg
	1g SAR W/kg	1g SAR W/kg	1g SAR W/kg		
Rear Face	0.90	1.19	0.34	1.24	1.53
Left Side	0.00	0.00	0.00	0.00	0.00
Right Side	0.35	1.12	0.09	0.44	1.21
Top Side	0.05	0.03	0.00	0.05	0.03
Bottom Side	0.00	0.03	0.00	0.00	0.03

Annex I. SAR to Peak Location Separation Ratio Analysis.

Since sum of simultaneous transmission SAR is less than the SAR limit for Body / Head : SAR_{1g} 1.6 W/kg ;
Extremity SAR_{10g} 4.0 W/kg. There is no requirement for SAR to Peak Location Separation Ratio Analysis.

Annex J. Calibration of Test Equipment List

Calibration of Test Equipment List are shown as below.

Equipment for SAR Test

Equipment	Manufacturer	Model	SN	Cal. Date	Cal. Interval
System Validation Dipole	SPEAG	D2450V2	835	Jun. 22, 2021	1 Year
System Validation Dipole	SPEAG	D5GHzV2	1019	Mar. 19, 2021	1 Year
Dosimetric E-Field Probe	SPEAG	EX3DV4	7537	Apr. 26, 2021	1 Year
Dosimetric E-Field Probe	SPEAG	EX3DV4	7554	Aug. 26, 2021	1 Year
Data Acquisition Electronics	SPEAG	DAE4	1585	Apr. 15, 2021	1 Year
Data Acquisition Electronics	SPEAG	DAE4	1589	Aug. 20, 2021	1 Year
Spectrum Analyzer	R&S	FSL6	102006	Apr. 06, 2021	1 Year
Power Meter	Anritsu	ML2495A	1218009	Jun. 24, 2021	1 Year
Thermometer	YFE	YF-160A	191100743	Apr. 12, 2021	1 Year
Dielectric Assessment Kit	SPEAG	DAKS-3.5	1151	Jul. 14, 2021	1 Year
Powersource1	SPEAG	SE_UMS_160 BA	4010	Jul. 13, 2021	1 Year

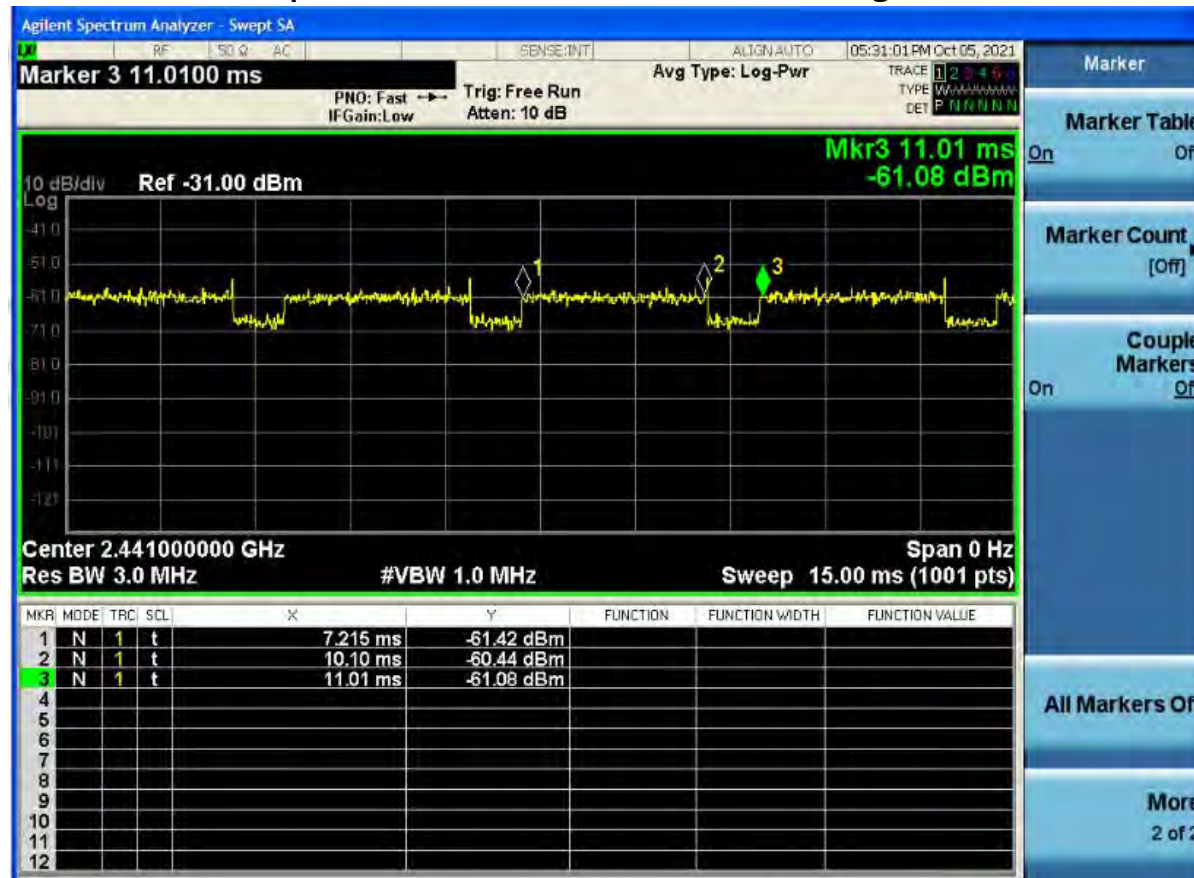
Annex K. Considerations Related to Bluetooth for Setup and Testing

This device has installed Bluetooth engineering testing software which can provide continuous transmitting RF signal. During Bluetooth SAR testing, this device was operated to transmit continuously at the maximum transmission duty with specified transmission mode, operating frequency, lowest data rate, and maximum output power.

The Bluetooth call box has been used during SAR measurement and the EUT was set to DH5 mode at the maximum output power. Its duty factor was calculated as below and the measured SAR for Bluetooth would be scaled to the 100% transmission duty factor to determine compliance.

The duty factor of Bluetooth signal are shown as below.

<Time-domain plot for Bluetooth transmission signal>



Time-domain plot for Bluetooth transmission signal

The duty factor of Bluetooth signal has been calculated as following.

$$\text{Duty Factor} = \text{Pulse Width} / \text{Total Period} = (10.1 - 7.215) / (11.01 - 7.215) = 76.02\%$$

Annex Z. Calibration Certificate for Probe and Dipole

The SPEAG calibration certificates are shown as follows.



In Collaboration with
s p e a g
CALIBRATION LABORATORY



中国认可
国际互认
校准
CALIBRATION
CNAS L0570

Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, Chi
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Client

AUDEN

Certificate No: Z21-60241

CALIBRATION CERTIFICATE

Object

D2450V2 - SN: 835

Calibration Procedure(s)

FF-Z11-003-01

Calibration Procedures for dipole validation kits

Calibration date:

June 22, 2021

This calibration Certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22±3)°C and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	106277	23-Sep-20 (CTTL, No.J20X08336)	Sep-21
Power sensor NRP8S	104291	23-Sep-20 (CTTL, No.J20X08336)	Sep-21
Reference Probe EX3DV4	SN 3846	26-Apr-21(CTTL-SPEAG,No.Z21-60084)	Apr-22
DAE4	SN 549	08-Jan-21(CTTL-SPEAG,No.Z21-60002)	Jan-22
Secondary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Signal Generator E4438C	MY49071430	01-Feb-21 (CTTL, No.J21X00593)	Jan-22
NetworkAnalyzer E5071C	MY46110673	14-Jan-21 (CTTL, No.J21X00232)	Jan-22

	Name	Function	Signature
Calibrated by:	Zhao Jing	SAR Test Engineer	
Reviewed by:	Lin Hao	SAR Test Engineer	
Approved by:	Qi Dianyuan	SAR Project Leader	

Issued: June 26, 2021

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

Certificate No: Z21-60241

Page 1 of 6



In Collaboration with

s p e a g
CALIBRATION LABORATORY

Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Glossary:

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

Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- IEC 62209-1, "Measurement procedure for assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices- Part 1: Device used next to the ear (Frequency range of 300MHz to 6GHz)", July 2016
- IEC 62209-2, "Procedure to measure the Specific Absorption Rate (SAR) For wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz)", March 2010
- KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

Additional Documentation:

- DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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



In Collaboration with

s p e a g**CALIBRATION LABORATORY**

Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China

Tel: +86-10-62304633-2079

Fax: +86-10-62304633-2504

E-mail: cttl@chinattl.com

http://www.chinattl.cn

Measurement Conditions

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

DASY Version	DASY52	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	39.3 $\pm$ 6 %	1.78 mho/m $\pm$ 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.1 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	52.7 W/kg $\pm$ 18.8 % (k=2)
SAR averaged over 10 cm³ (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	5.96 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	23.9 W/kg $\pm$ 18.7 % (k=2)



In Collaboration with

s p e a g

CALIBRATION LABORATORY

Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	54.7Ω+ 3.65jΩ
Return Loss	- 24.9dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.072 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
-----------------	-------



In Collaboration with

s p e a g
CALIBRATION LABORATORY

Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

DASY5 Validation Report for Head TSL

Date: 06.22.2021

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 835

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

Medium parameters used: $f = 2450$ MHz; $\sigma = 1.784$ S/m; $\epsilon_r = 39.31$; $\rho = 1000$ kg/m³

Phantom section: Center Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3846; ConvF(7.45, 7.45, 7.45) @ 2450 MHz; Calibrated: 2021-04-26
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn549; Calibrated: 2021-01-08
- Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

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

Reference Value = 98.68 V/m; Power Drift = -0.05 dB

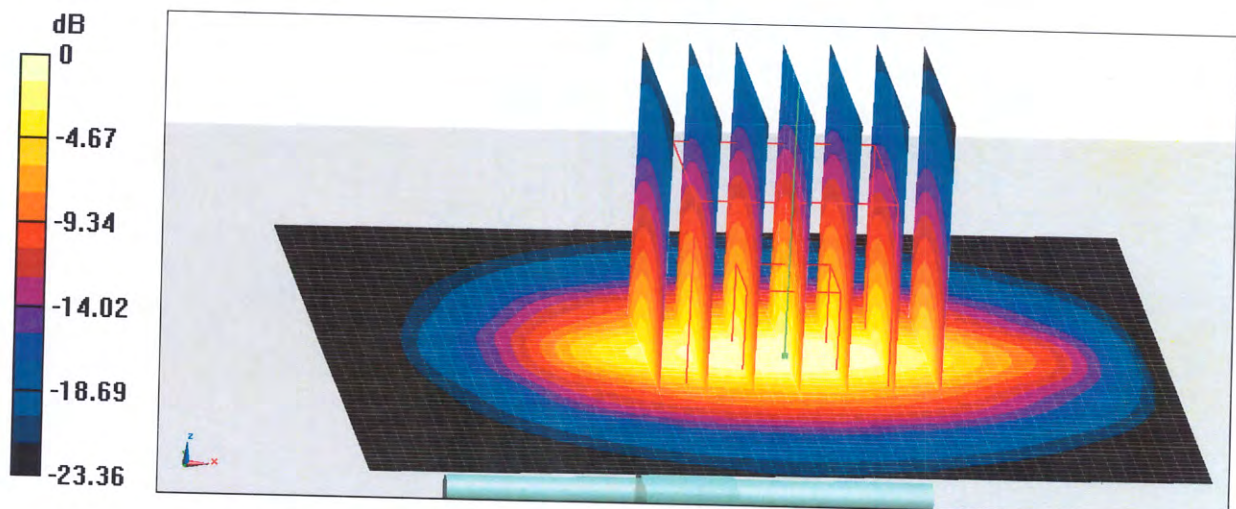
Peak SAR (extrapolated) = 28.5 W/kg

SAR(1 g) = 13.1 W/kg; SAR(10 g) = 5.96 W/kg

Smallest distance from peaks to all points 3 dB below = 9 mm

Ratio of SAR at M2 to SAR at M1 = 45.4%

Maximum value of SAR (measured) = 22.7 W/kg



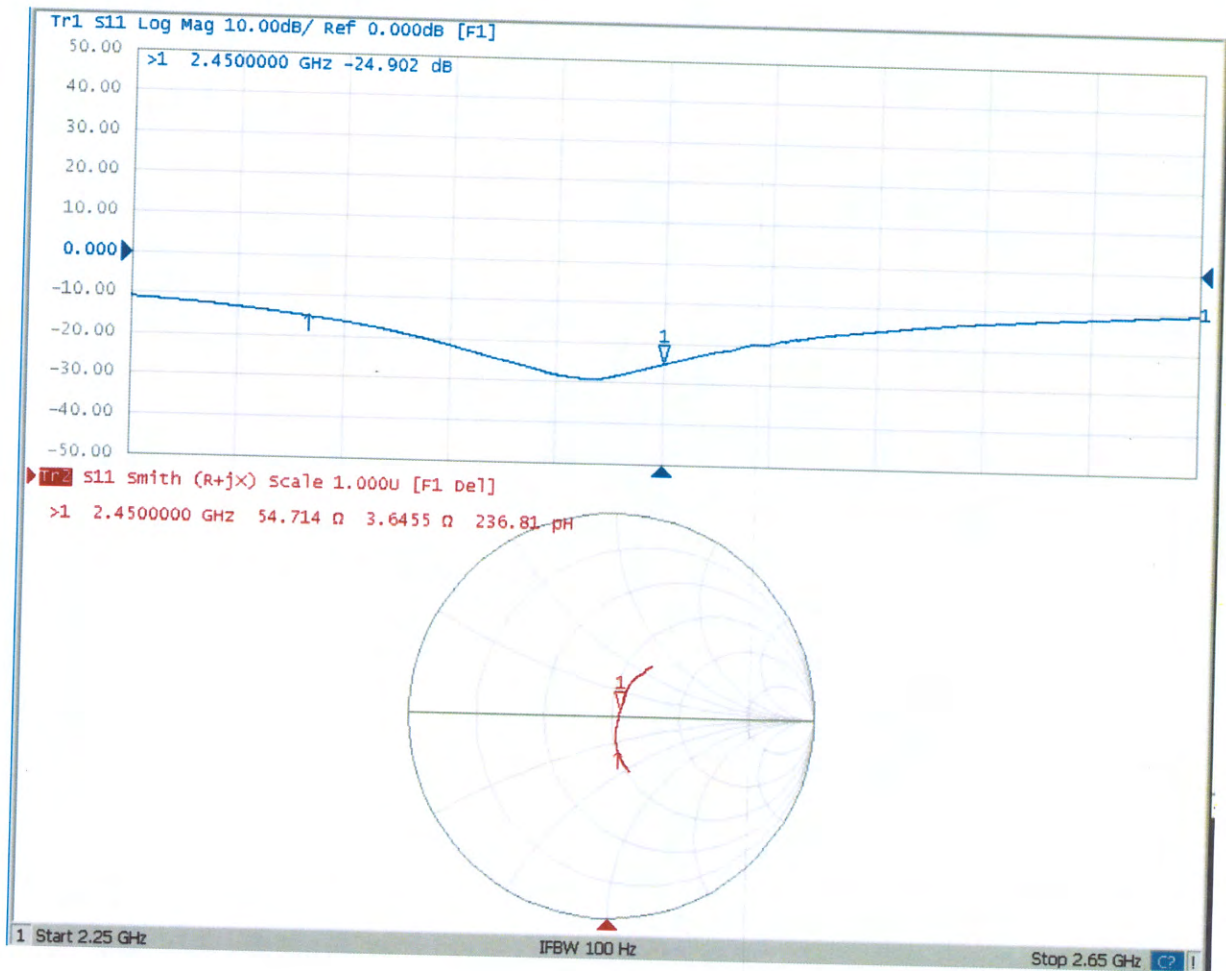
0 dB = 22.7 W/kg = 13.56 dBW/kg



In Collaboration with
s p e a g
CALIBRATION LABORATORY

Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Impedance Measurement Plot for Head TSL





Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: **SCS 0108**

The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Client **B.V. ADT (Auden)**

Certificate No: **D5GHzV2-1019_Mar21**

CALIBRATION CERTIFICATE

Object **D5GHzV2 - SN:1019**

Calibration procedure(s) **QA CAL-22.v6
Calibration Procedure for SAR Validation Sources between 3-10 GHz**

Calibration date: **March 19, 2021**

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 $(22 \pm 3)^{\circ}\text{C}$ 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	01-Apr-20 (No. 217-03100/03101)	Apr-21
Power sensor NRP-Z91	SN: 103244	01-Apr-20 (No. 217-03100)	Apr-21
Power sensor NRP-Z91	SN: 103245	01-Apr-20 (No. 217-03101)	Apr-21
Reference 20 dB Attenuator	SN: BH9394 (20k)	31-Mar-20 (No. 217-03106)	Apr-21
Type-N mismatch combination	SN: 310982 / 06327	31-Mar-20 (No. 217-03104)	Apr-21
Reference Probe EX3DV4	SN: 3503	30-Dec-20 (No. EX3-3503_Dec20)	Dec-21
DAE4	SN: 601	02-Nov-20 (No. DAE4-601_Nov20)	Nov-21
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB39512475	30-Oct-14 (in house check Oct-20)	In house check: Oct-22
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-20)	In house check: Oct-22
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-20)	In house check: Oct-22
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-20)	In house check: Oct-22
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-20)	In house check: Oct-21

Calibrated by: **Claudio Leubler** **Laboratory Technician**

Approved by: **Katja Pokovic** **Technical Manager**

Signature

Issued: March 19, 2021

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



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

Accreditation No.: **SCS 0108**

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

- DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom 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	5250 MHz $\pm$ 1 MHz 5600 MHz $\pm$ 1 MHz 5750 MHz $\pm$ 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 $\pm$ 0.2) °C	34.7 $\pm$ 6 %	4.51 mho/m $\pm$ 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5250 MHz

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.13 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	80.6 W/kg $\pm$ 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.32 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	23.0 W/kg $\pm$ 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 $\pm$ 0.2) °C	34.2 $\pm$ 6 %	4.86 mho/m $\pm$ 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	8.32 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	82.4 W/kg $\pm$ 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.36 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	23.3 W/kg $\pm$ 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	34.0 ± 6 %	5.01 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5750 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.02 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	79.4 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.27 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	22.4 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	54.1 Ω - 6.4 j Ω
Return Loss	- 22.7 dB

Antenna Parameters with Head TSL at 5600 MHz

Impedance, transformed to feed point	57.6 Ω - 2.5 j Ω
Return Loss	- 22.6 dB

Antenna Parameters with Head TSL at 5750 MHz

Impedance, transformed to feed point	57.9 Ω + 3.1 j Ω
Return Loss	- 22.1 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.203 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: 19.03.2021

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1019

Communication System: UID 0 - CW; Frequency: 5250 MHz, Frequency: 5600 MHz, Frequency: 5750 MHz

Medium parameters used: $f = 5250$ MHz; $\sigma = 4.51$ S/m; $\epsilon_r = 34.7$; $\rho = 1000$ kg/m³

Medium parameters used: $f = 5600$ MHz; $\sigma = 4.86$ S/m; $\epsilon_r = 34.2$; $\rho = 1000$ kg/m³

Medium parameters used: $f = 5750$ MHz; $\sigma = 5.01$ S/m; $\epsilon_r = 34$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.5, 5.5, 5.5) @ 5250 MHz, ConvF(5.1, 5.1, 5.1) @ 5600 MHz, ConvF(5.08, 5.08, 5.08) @ 5750 MHz; Calibrated: 30.12.2020
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 02.11.2020
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Dipole Calibration for Head Tissue/Pin=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 = 79.20 V/m; Power Drift = -0.00 dB

Peak SAR (extrapolated) = 27.6 W/kg

SAR(1 g) = 8.13 W/kg; SAR(10 g) = 2.32 W/kg

Smallest distance from peaks to all points 3 dB below = 7.2 mm

Ratio of SAR at M2 to SAR at M1 = 70.7%

Maximum value of SAR (measured) = 18.1 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 = 77.00 V/m; Power Drift = -0.05 dB

Peak SAR (extrapolated) = 31.0 W/kg

SAR(1 g) = 8.32 W/kg; SAR(10 g) = 2.36 W/kg

Smallest distance from peaks to all points 3 dB below = 7.2 mm

Ratio of SAR at M2 to SAR at M1 = 66.9%

Maximum value of SAR (measured) = 19.6 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 = 74.22 V/m; Power Drift = -0.08 dB

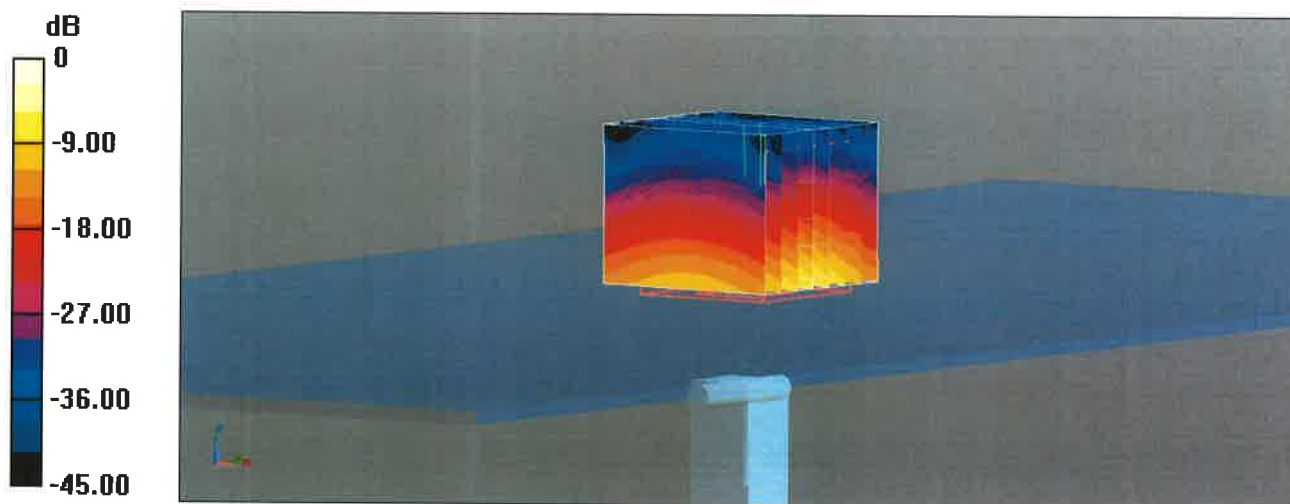
Peak SAR (extrapolated) = 31.6 W/kg

SAR(1 g) = 8.02 W/kg; SAR(10 g) = 2.27 W/kg

Smallest distance from peaks to all points 3 dB below = 7.2 mm

Ratio of SAR at M2 to SAR at M1 = 65%

Maximum value of SAR (measured) = 19.2 W/kg



0 dB = 19.6 W/kg = 12.92 dBW/kg

Impedance Measurement Plot for Head TSL

