SAR Compliance Test Report

Date of Report	29/05/2023	**Client's Contact person:**	Stephane Ranchon
Number of pages:	46		
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Testing laboratory:	**Verkotan Oy** Elektroniikkatie 17 90590 Oulu Finland	**Client:**	**LCIE BUREAU VERITAS** ZI Centr'Alp 170 rue de Chatagnon 38430 Moirans France
		Applicant:	**INGENICO** 9 Avenue de la gare - Rovaltain TGV BP25156 VALENCE Cedex 9 FRANCE 26958
Tested device	**Desk/2600 CL/WiFi**		
Related reports:	-		
Testing has been carried out in accordance with:	**47CFR §2.1093** Radiofrequency Radiation Exposure Evaluation: Portable Devices **FCC published RF exposure KDB procedures** **IEC/IEEE 62209-1528, 2020** Measurement procedure for the assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices **RSS-102, Issue 5, 2015** Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)		
Documentation:	The test report must always be reproduced in full; reproduction of an excerpt only is subject to written approval of the testing laboratory		
Test Results:	**The EUT complies with the requirements in respect of all parameters subject to the test.** The test results relate only to devices specified in this document		
Date and signatures:	29.05.2023 **Laboratory Manager** Miia Nurkkala Digitaalinen allekirjoittaja: Miia Nurkkala Päiväys: 2023.05.29 09:00:15 +03'00'		

TABLE OF CONTENTS

1. SUMMARY OF SAR TEST REPORT

1.1 Test Details

Equipment under Test (DUT):

Product:	Payment terminal
Manufacturer:	Ingenico
Model:	Desk/2600 CL/WiFi
Serial Number:	23058731708132772981695 1 (SAR sample), 23058731708132772981689 8 (conducted sample)
FCC ID Number:	XKB-D2600CLW
ISED ID Number:	2586D-D2600CLW
DUT Number:	21185 (SAR sample), 21183 (conducted sample)
Battery Type used in testing:	Li-Ion Battery
State of the Sample:	Production sample

Testing information:

Testing performed:	11.05.2023 – 16.05.2023
Notes:	Changed DUT name format and removed blank pages.
Document history:	This report replaces report ID: "FCC ISED_SAR report_Desk2600_ID6087_26052023.docx"
Document ID:	FCC ISED_SAR report_Desk2600_ID6087_29052023.docx
Temperature °C	22±2 / Controlled
Humidity RH%	30±20 / Controlled
Measurement performed by:	Kalle Orava
FCC Test Firm Designation Number:	FI0005
ISED Company Number:	22218

1.2 Maximum Results

The maximum reported* SAR values for Extremity-configuration for transmitting systems are shown in a table below. The device conforms to the requirements of the standards when the maximum reported SAR value is less than or equal to the limit. The SAR limit specified in FCC 47 CFR part 2 (2.1093) and Health Canada's RF exposure guideline, Safety Code 6 for Extremity SAR_{10g} is 4.0 W/kg.

1.2.1 Standalone SAR

System	Highest Reported* SAR_{10g}(W/kg) in Extremity Exposure Condition, 0mm separation	Result
2.4 GHz WLAN	0.90	**PASS**
5 GHz WLAN	1.22	**PASS**

* Reported SAR Values are scaled to upper limit of power tuning tolerance.

1.2.2 Simultaneous Transmission SAR

1.2.2.1 FCC

Highest Simultaneous Transmission SAR	SAR_{10g}(W/kg) in Extremity Exposure Condition
2.4 GHz WLAN + 5 GHz WLAN + NFC	**2.121**

1.2.3 ISED

Highest Simultaneous Transmission SAR	SAR_{10g}(W/kg) in Extremity Exposure Condition
2.4 GHz WLAN + 5 GHz WLAN + NFC	**2.126**

1.2.4 Maximum Drift

Maximum Drift During Measurements	-0.92 dB*

*Larger than 5% drifts included to scaling factors

1.2.5 Measurement Uncertainty

SAR10g: 0.3 – 3 GHz:

Expanded Uncertainty (k=2) 95 %	±21.9 %

SAR10g: 3 – 6 GHz:

Expanded Uncertainty (k=2) 95 %	±23.8 %

2. DESCRIPTION OF THE DEVICE UNDER TEST (DUT)

The DUT is a payment terminal which supports 2.4 GHz & 5 GHz WLAN, with NFC.

Measurement report "Desk2600 cless Antenna.pdf" states antenna gain of -12dBi for the NFC.

Figure 1. Overview of the DUT

Device Category	Portable
Exposure Environment	General population uncontrolled

2.1 Supported Frequency Bands and Operational Modes

TX Frequency bands	Modes of Operation	Transmitter Frequency Range [MHz]
	WLAN 2.4 GHz	2412 – 2462
	WLAN 5GHz	5180 – 5825
	NFC	13.56

2.2 Test Exemptions

2.2.1 FCC

Exemption power threshold for distances ≤50mm in mW for less than 100 MHz, was calculated using the following equation below, stated in 447498 D01 General RF Exposure Guidance DR05-44791:

$$P_{7X}(d_{mm}, f_{MHz}) = S_f(f_{MHz}) * P_{431a}(d_{mm}, f_{MHz}) + \left(1 - S_f(f_{MHz})\right) * S_d(d_{mm}) P_{431b1}(50., 100.) * \left((1 + \log_{10}\left(\frac{100.}{f_{MHz}}\right)\right)$$

(Equation 1)

where,

$$S_f(f_{MHz}) = -\frac{e^{(f_{MHz}-100)^2}}{250}$$ (Equation 2)

$$S_d(d_{mm}) = \frac{1}{2} + \frac{\frac{(d_{mm}-50)^2}{250}}{2}$$ (Equation 3)

$$P_{431a}(d_{mm}, f_{MHz}) = \frac{3\, d_{mm}}{\sqrt{f_{MHz}/1000}}$$ (Equation 4)

$$P_{431b1}(d_{mm}, f_{MHz}) = \frac{3\, d_{mm}}{\sqrt{f_{MHz}/1000}} + \frac{(d_{mm}-50)*f_{MHz}}{150}$$ (Equation 5)

Transmission mode	Frequency [MHz]	Separation distance [cm]	P_{7x} [mW]
NFC	13.56	0.5	443

2.2.1.1 Maximum defined Output Power and ERP

Maximum output power of the DUT's NFC's transmitter is 0 dBm i.e. 1 mW.

According to Appendix B at 447498 D01 General RF Exposure Guidance DR05-44791, the table (B.1.) defines the thresholds for available maximum time-averaged power or maximum time-

averaged ERP, whichever is greater. Since the maximum output power is greater than the ERP of the DUT for NFC, it is used for SAR test exemption.

Transmission mode	Output power [dBm]	Output power [mW]	Power Gain of Antenna G [dBi]	ERP Output power [dBm]	ERP Output power [mW]	P_{7x} [mW]
NFC	0	1	-12	-14.15	0.04	443

2.2.2 ISED

SAR test exemption output power limits based on frequency and separation distance are from RSS-102, issue 5, 2015:

Table 1: SAR evaluation – Exemption limits for routine evaluation based on frequency and separation distance[4,5]

Frequency (MHz)	Exemption Limits (mW)				
	At separation distance of ≤5 mm	At separation distance of 10 mm	At separation distance of 15 mm	At separation distance of 20 mm	At separation distance of 25 mm
≤300	71 mW	101 mW	132 mW	162 mW	193 mW
450	52 mW	70 mW	88 mW	106 mW	123 mW
835	17 mW	30 mW	42 mW	55 mW	67 mW
1900	7 mW	10 mW	18 mW	34 mW	60 mW
2450	4 mW	7 mW	15 mW	30 mW	52 mW
3500	2 mW	6 mW	16 mW	32 mW	55 mW
5800	1 mW	6 mW	15 mW	27 mW	41 mW

SAR test exclusion power threshold for 13.56 MHz is 71mW at ≤5mm separation distance.

2.2.2.1.1 Maximum defined output power and EIRP

According to the manufacturer NFC transmitter maximum TX output power is 0 dBm i.e. 1 mW. Peak antenna gain is -12dBi according to datasheet "Desk2600 cless Antenna.pdf".

Maximum output power of the DUT's NFC transmitter is 0 dBm i.e. 1 mW. Since the maximum output power is greater than the EIRP of the DUT for NFC, it is used for SAR test exemption.

Transmission mode	Output power [dBm]	Output power [mW]	Power Gain of Antenna, G [dBi]	EIRP Output power [dBm]	EIRP Output power [mW]

NFC	0	1	-12	-12	0.06

The maximum output power of the NFC is below the test exclusion threshold.

2.3 Simultaneous transmission

Possible simultaneous transmissions are:

WLAN 2.4GHz + WLAN 5 GHz + NFC

3. OUTPUT POWER

3.1 Maximum specified conducted output power

From the customer, including tune-up tolerances;

WLAN 2.4GHz	Max Output Power [dBm]
802.11b	21
802.11g	19
802.11n	19

WLAN 5GHz	Max Output Power [dBm]
802.11a	20
802.11n	19

NFC	Max Output Power [dBm]
	0

3.2 Tested conducted power

Measured conducted output power at transmitting antenna connector;

WLAN 2.4 GHz:

Standard	Transmission mode	Data rate [Mbps]	Output power [dBm]		
			CH 1 2412 MHz	CH 6 2437 MHz	CH 11 2462 MHz
802.11b	DSSS	1	19.29	19.16	19.06

5GHz WLAN:

Standard	Channel	Frequency [MHz]	Transmission mode	Data Rate [Mbps]	Output power [dBm]
802.11a	52	5260	OFDM	6	18.71
802.11a	56	5280	OFDM	6	18.66
802.11a	60	5300	OFDM	6	18.7
802.11a	64	5320	OFDM	6	18.6
802.11a	100	5500	OFDM	6	18.42
802.11a	112	5560	OFDM	6	18.08
802.11a	116	5580	OFDM	6	18.01
802.11a	128	5640	OFDM	6	17.61
802.11a	132	5660	OFDM	6	17.61
802.11a	149	5745	OFDM	6	18.05
802.11a	165	5825	OFDM	6	18.06

4. TEST EQUIPMENT

Dasy52 near field scanning system, manufactured by SPEAG was used for SAR testing. The test system consists of high precision robotics system (Staubli), robot controller, computer, near-field probe, probe alignment sensor, and a phantom containing the tissue equivalent material. The robot is a six-axis industrial robot performing precise movements to position the probe to the location of maximum electromagnetic field.

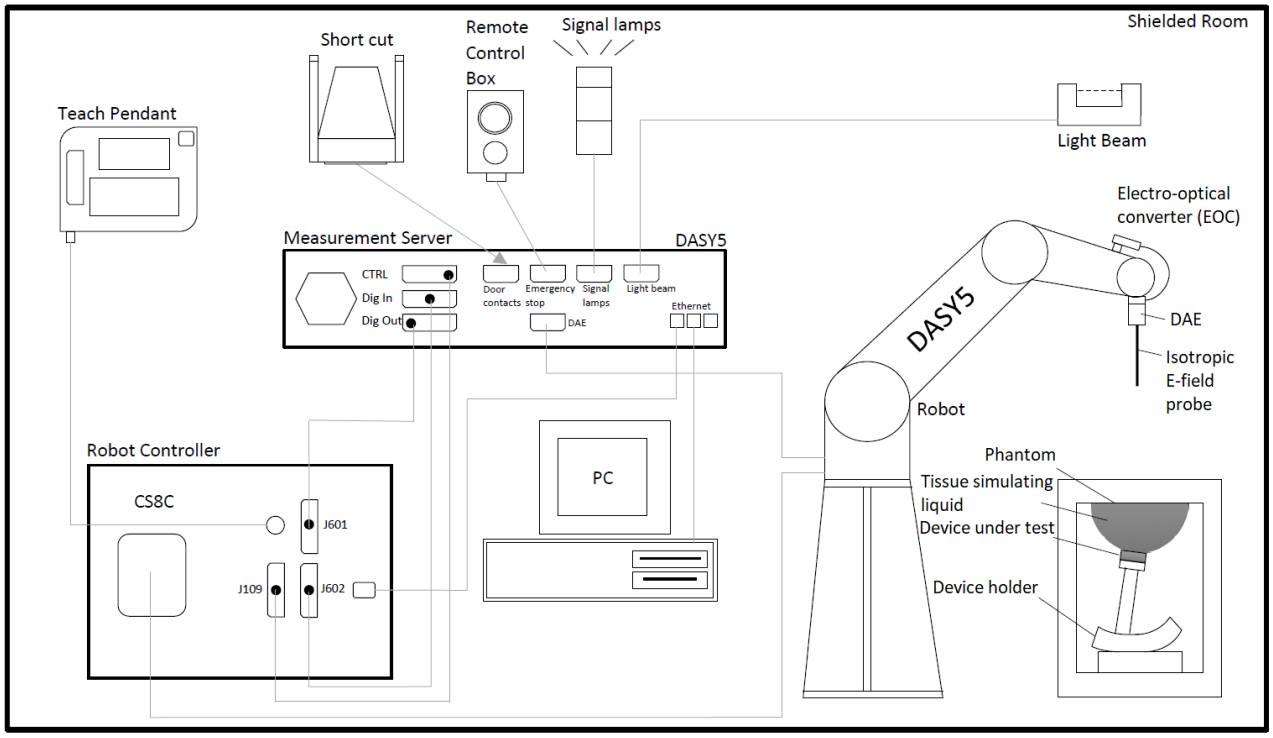


Figure 2 Schematic Laboratory Picture

4.1 Test Equipment List

Main used test system components are listed below. For full equipment list and calibration intervals, please contact the testing laboratory.

Test Equipment	Model	Serial Number	Calibration Date	Interval [years]
DASY5 Software	52.8.8.1258	-	NA	NA
Amplifier	5GHz	-	NA	NA
Amplifier, 800MHz-4200MHz	10S1G4A	320421	NA	NA
DAE4, converter	DAE4	705	04/2023	1
Inline Peak Power Sensor	MA24105A	2102058	11/2022	1
Isotropic DOS probe	EX3DV4	3852	10/2022	1
Power Sensor	NRP-Z11	100265	12/2022	1
System validation dipole	D2450V2	729	07/2022	3
System validation dipole	D5GHzV2	1045	03/2023	3
Network Analyzer	E5071C	MY46102812	05/2022	1

4.1.1 Isotropic E-field Probe Type EX3DV4

Construction	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Calibration	Calibration certificate in Appendix D
Frequency	10 MHz to >6 GHz (dosimetry); Linearity: ± 0.2 dB (30 MHz to 6 GHz)
Directivity	± 0.3 dB in HSL (rotation around probe axis) ± 0.5 dB in tissue material (rotation normal to probe axis)
Dynamic Range	10 µW/g to > 100 mW/g, Linearity: ± 0.2 dB
Dimensions	Overall length: 330 mm Tip length: 10 mm Body diameter: 12 mm
Application	General dosimetry up to 6 GHz Compliance tests of mobile phones Fast automatic scanning in arbitrary phantoms

4.2 Phantoms

Eli Phantom:

The phantom used in SAR tests was an ELI phantom, manufactured by SPEAG. ELI phantom is used for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. The phantom conforms to the requirements of IEC/IEEE 62209-1528 and FCC published RF Exposure KDB Procedures.

4.3 Tissue Simulants

Recommended values for the dielectric parameters of the tissue simulants are given in IEC/IEEE 62209-1528 and FCC published RF Exposure KDB Procedures. The dielectric parameters of the used tissue simulants were within ±10% of the recommended values at frequencies under 3GHz and ±5% at frequencies above 3GHz. A liquid compensation algorithm was used in DASY5 with which measured peak average SAR values were corrected for the deviation of used liquid. Depth of the tissue simulant was at least 15.0 cm from the inner surface of the flat phantom.

Tissue simulant liquid Ingredients
Deionized Water, tween, salt

4.4 System Validation Status

Frequency [MHz]	Dipole Type / SN	Probe Type / SN	Calibrated Signal Type	DAE Unit / SN	Dielectric Constant [ε']	Conductivity σ [S/m]	Date
2450	D2450V2 - SN: 758	EX3DV4 - SN: 3852	CW	DAE 4 / 710	40.46	1.75	11/2022
5250	D5GHzV2 - SN: 1014	EX3DV4 - SN: 3852	CW	DAE 4 / 710	37.44	4.66	11/2022
5600	D5GHzV2 - SN: 1014	EX3DV4 - SN: 3852	CW	DAE 4 / 710	36.79	5.07	11/2022
5750	D5GHzV2 - SN: 1014	EX3DV4 - SN: 3852	CW	DAE 4 / 710	36.62	5.19	11/2022

4.5 System Check

Date	Tissue Type	Tissue Temp. [°C]	Frequency [MHz]	Input Power [mW]	Measured SAR_{1g} [W/kg]	1 W Target SAR_{1g} [W/kg]	1 W Normalized SAR_{1g} [W/kg]	Deviation [%]	Plot #
09.05.2023	WB Head	22	2450	250	13.7	52.3	54.8	4.78	1
11.05.2023	WB Head	22	5250	250	7.5	73.09	75	2.61	2
11.05.2023	WB Head	22	5600	250	7.23	72.92	72.3	-0.85	3
15.05.2023	WB Head	22	5600	250	7.71	72.92	77.1	5.73	4
15.05.2023	WB Head	22	5750	250	7.2	69.05	72	4.27	5

4.5.1 Tissue Simulant Verification

				Target		Measured		Deviation	
Date	Tissue Type	Tissue Temp [°C]	Frequency [MHz]	Dielectric Constant [ε] Target	Conductivity σ [S/m] Target	Dielectric Constant [ε]	Conductivity σ [S/m]	ε [%]	σ [%]
09.05.2023	WB Head	22.3	2412.0	39.27	1.77	39.87	1.66	1.5	-6.2
09.05.2023	WB Head	22.3	2437.0	39.22	1.79	39.83	1.67	1.5	-6.4
09.05.2023	WB Head	22.3	2450.0	39.2	1.8	39.82	1.68	1.6	-6.5
09.05.2023	WB Head	22.3	2462.0	39.18	1.81	39.79	1.69	1.6	-6.7
11.05.2023	WB Head	21.6	5250.0	35.95	4.71	34.33	4.86	-4.5	3.3
11.05.2023	WB Head	21.6	5260.0	35.94	4.72	34.31	4.87	-4.5	3.2
11.05.2023	WB Head	21.6	5300.0	35.9	4.76	34.25	4.9	-4.6	3.0
11.05.2023	WB Head	21.6	5320.0	35.88	4.78	34.22	4.92	-4.6	2.9
11.05.2023	WB Head	21.6	5600.0	35.5	5.07	33.84	5.15	-4.7	1.6
15.05.2023	WB Head	22.1	5250.0	35.95	4.71	34.82	4.83	-3.1	2.6
15.05.2023	WB Head	22.1	5500.0	35.65	4.96	34.49	5.03	-3.2	1.4
15.05.2023	WB Head	22.1	5560.0	35.56	5.03	34.43	5.1	-3.2	1.4
15.05.2023	WB Head	22.1	5600.0	35.5	5.07	34.37	5.13	-3.2	1.1
15.05.2023	WB Head	22.1	5640.0	35.46	5.11	34.32	5.16	-3.2	1.1
15.05.2023	WB Head	22.1	5660.0	35.44	5.13	34.31	5.18	-3.2	1.0
15.05.2023	WB Head	22.1	5745.0	35.35	5.22	34.2	5.26	-3.3	0.8
15.05.2023	WB Head	22.1	5825.0	35.28	5.3	34.1	5.32	-3.3	0.5

5. TEST PROCEDURE

Testing was carried out in accordance with FCC KDB Publications 447498 D04 Interim General RF Exposure Guidance v01, 248227 D01 802.11 Wi-Fi SAR and RSS-102, Issue 5.

Low, mid and high frequency channels for the configuration with the highest SAR value were tested as per ISED notice 2016-DRS001.

A control software for WLAN was used to set the DUT to transmit at maximum power and maximum duty cycle of 68.7%. Reported SAR is then scaled to 100%, according to 248227 D01 802.11 Wi-Fi SAR, section 2.2.

The WLAN transmission modes for testing were selected according to largest channel bandwidth configuration, lowest order modulation and lowest data rate.
WLAN 2.4GHz was tested with 802.11b standard with data rate of 1Mbit/s and WLAN 5GHz was tested with 802.11a standard with data rate of 6Mbit/s.

5.1 Device Holder

The device was placed in the device holder (illustrated below) that is supplied by SPEAG as an integral part of the Dasy system.

Device holder supplied by SPEAG

5.2 Test Positions

5.2.1 Extremity Configuration, 0mm separation distance

Extremity SAR was tested from all of the sides of the device. The device was placed on the top of a Rohacell and lifted towards the phantom until the distance between the phantom and the device was 0mm.

Photos of the test positions are presented in appendix A.

5.3 Scan Procedures

First, area scans were used for determination of the field distribution. Next, a zoom scan was performed around the highest E-field value to determine the averaged SAR value. Drift

was determined by measuring the same point at the start of the area scan and again at the end of the zoom scan.

5.4 SAR Averaging Methods

The maximum SAR value was averaged over a cube of tissue using interpolation and extrapolation.

The interpolation, extrapolation and maximum search routines within Dasy52 are all based on the modified Quadratic Shepard's method (Robert J. Renka," Multivariate Interpolation of Large Sets of Scattered Data", University of North Texas ACM Transactions on Mathematical Software, vol. 14, no. 2, June 1988, pp. 139-148).
The interpolation scheme combines a least-square fitted function method with a weighted average method. A trivariate 3-D / bivariate 2-D quadratic function is computed for each measurement point and fitted to neighboring points by a least-square method. For the zoom scan, inverse distance weighting is incorporated to fit distant points more accurately. The interpolating function is finally calculated as a weighted average of the quadratics.

In the zoom scan, the interpolation function is used to extrapolate the Peak SAR from the deepest measurement points to the inner surface of the phantom.

6. MEASUREMENT UNCERTAINTY

DASY5 Uncertainty Budget
According to IEC/IEEE 62209-1528
(Frequency band: 3GHz - 6GHz range)

Symbol	Error Description	Uncert. value	Prob. Dist.	Div.	(c_i) 1g	(c_i) 10g	Std. Unc. (1g)	Std. Unc. (10g)
Measurement System Errors								
CF	Probe Calibration	±14.0%	N	√2	1	1	±7.0%	±7.0%
CF_{drift}	Probe Calibration Drift	±1.7%	N	√3	1	1	±1.0%	±1.0%
LIN	Probe Linearity	±4.7%	R	√3	1	1	±2.7%	±2.7%
BBS	Broadband Signal	±2.6%	R	√3	1	1	±1.5%	±1.5%
ISO	Probe Isotropy	±7.6%	R	3	1	1	±4.4%	±4.4%
DAE	Data Acquisition	±0.3%	N	1	1	1	±0.3%	±0.3%
AMB	RF Ambient	±1.8%	N	1	1	1	±1.8%	±1.8%
Δ_{sys}	Probe Positioning	±3.9%	N	1	0.33	0.33	±1.3%	±1.3%
DAT	Data Processing	±2.3%	N	1	1	1	±2.3%	±2.3%
Phantom and Device Errors								
LIQ(σ)	Conductivity (meas.)^{DAK}	±2.5%	N	√1	0.78	0.71	±2.0%	±1.8%
LIQ(T_σ)	Conductivity (temp.)^{BB}	±3.4%	R	√3	0.78	0.71	±1.5%	±1.4%
EPS	Phantom Permittivity	±14.0%	R	3	0.25	0.25	±2.0%	±2.0%
DIS	Distance DUT - TSL	±2.0%	N	1	2	2	±4.0%	±4.0%
D_{xyz}	Device Positioning (±0.5mm)	±1.0%	N	1	1	1	±1.0%	±1.0%
H	Device Holder	±3.6%	N	√1	1	1	±3.6%	±3.6%
MOD	DUT Modulation^{m}	±2.4%	R	√3	1	1	±1.4%	±1.4%
TAS	Time-average SAR	±2.6%	R	3	1	1	±1.5%	±1.5%
RF_{drift}	DUT drift	±2.5%	N	1	1	1	±2.5%	±2.5%
VAL	Val Antenna Unc.^{val}	±0.0%	N	1	1	1	±0%	±0%
RF_{in}	Unc. Input Power^{val}	±0.0%	N	1	1	1	±0%	±0%
Correction to the SAR results								
C(ε, σ)	Deviation to Target	±1.9%	N	√1	1	0.84	±1.9%	±1.6%
C(R)	SAR scaling^{p}	±0%	R	3	1	1	±0%	±0%
u(ΔSAR)	Combined Uncertainty						±12.0%	±11.9%
U	**Expanded Uncertainty**						±24.0%	±23.8%

DASY5 Uncertainty Budget

According to IEC/IEEE 62209-1528
(Frequency band: 300MHz - 3GHz range)

Symbol	Error Description	Uncert. value	Prob. Dist.	Div.	(c_i) 1g	(c_i) 10g	Std. Unc. (1g)	Std. Unc. (10g)
Measurement System Errors								
CF	Probe Calibration	±12.0%	N	√2	1	1	±6.0%	±6.0%
CF_{drift}	Probe Calibration Drift	±1.7%	R	√3	1	1	±1.0%	±1.0%
LIN	Probe Linearity	±4.7%	R	√3	1	1	±2.7%	±2.7%
BBS	Broadband Signal	±3.0%	R	√3	1	1	±1.7%	±1.7%
ISO	Probe Isotropy	±7.6%	R	3	1	1	±4.4%	±4.4%
DAE	Data Acquisition	±0.3%	N	1	1	1	±0.3%	±0.3%
AMB	RF Ambient	±1.8%	N	1	1	1	±1.8%	±1.8%
Δ_{sys}	Probe Positioning	±3.9%	N	1	0.14	0.14	±0.5%	±0.5%
DAT	Data Processing	±1.2%	N	1	1	1	±1.2%	±1.2%
Phantom and Device Errors								
LIQ(σ)	Conductivity (meas.)[DAK]	±2.5%	N	√1	0.78	0.71	±2.0%	±1.8%
$LIQ(T_\sigma)$	Conductivity (temp.)[BB]	±3.3%	R	√3	0.78	0.71	±1.5%	±1.4%
EPS	Phantom Permittivity	±14.0%	R	3	0	0	±0%	±0%
DIS	Distance DUT - TSL	±2.0%	N	1	2	2	±4.0%	±4.0%
D_{xyz}	Device Positioning (±0.5mm)	±1.0%	N	1	1	1	±1.0%	±1.0%
H	Device Holder	±3.6%	N	√1	1	1	±3.6%	±3.6%
MOD	DUT Modulation[m]	±2.4%	R	√3	1	1	±1.4%	±1.4%
TAS	Time-average SAR	±2.6%	R	3	1	1	±1.5%	±1.5%
RF_{drift}	DUT drift	±2.5%	N	1	1	1	±2.5%	±2.5%
VAL	Val Antenna Unc.[val]	±0.0%	N	1	1	1	±0%	±0%
RF_{in}	Unc. Input Power[val]	±0.0%	N	1	1	1	±0%	±0%
Correction to the SAR results								
C(ε, σ)	Deviation to Target	±1.9%	N	√1	1	0.84	±1.9%	±1.6%
C(R)	SAR scaling[p]	±0%	R	3	1	1	±0%	±0%
u(ΔSAR)	Combined Uncertainty						±11.0%	±10.9%
U	**Expanded Uncertainty**						±22.1%	±21.9%

7. TEST RESULTS

7.1 SAR Results for Extremity Condition with 0mm separation

2.4GHz WLAN:

Mode	Data Rate [Mbps]	Frequency [MHz]	Channel	Test position	Maximum Power [dBm]	Conducted Power [dBm]	Measured SAR_{10g} [W/kg]	Power Drift* [dB]	Scaling Factor	Duty Cycle [%]	Reported SAR_{10g} [W/kg]	Plot #
802.11b	1	2412	1	Front, 0mm	21	19.29	0.045	0.49	1.66	85	0.07	
802.11b	1	2412	1	Back. 0mm	21	19.29	0.17	-0.09	1.48	85	0.25	
802.11b	1	2412	1	Top, 0mm	21	19.29	0.009	N/A**	1.48	85	0.013	
802.11b	1	2412	1	Bottom, 0mm	21	19.29	0.045	-0.05	1.48	85	0.07	
802.11b	1	2412	1	Left, 0mm	21	19.29	0.50	-0.41	1.63	85	0.81	
802.11b	1	2412	1	Right, 0mm	21	19.29	0.04	0.21	1.48	85	0.05	
802.11b	1	2437	6	Left, 0mm	21	19.16	0.51	-0.07	1.53	85	0.78	
802.11b	1	2462	11	Left, 0mm	21	19.06	0.58	-0.07	1.56	85	0.90	6

*Larger than 5% drifts included to scaling factors
**Due to low e-field generated by DUT at the location of drift measurement, the measurements are not applicable.

5GHz WLAN:

Mode	Data Rate [Mbps]	Frequency [MHz]	Channel	Test position	Maximum Power [dBm]	Conducted Power [dBm]	Measured SAR_{10g} [W/kg]	Power Drift* [dB]	Scaling Factor	Used Duty Cycle [%]	Duty Cycle Scaling Factor	Reported SAR_{10g} [W/kg]	Plot #
802.11a	6	5260	52	Front, 0mm	20	18.71	0.03	-0.48	1.50	68.7	1.46	0.06	
802.11a	6	5260	52	Back. 0mm	20	18.71	0.32	-0.32	1.45	68.7	1.46	0.67	
802.11a	6	5260	52	Top, 0mm	20	18.71	0.00069	N/A**	1.35	68.7	1.46	0.001	
802.11a	6	5260	52	Bottom, 0mm	20	18.71	0.27	0.72	1.59	68.7	1.46	0.63	
802.11a	6	5260	52	Left, 0mm	20	18.71	0.48	-0.92	1.66	68.7	1.46	1.16	
802.11a	6	5260	52	Right, 0mm	20	18.71	0.0096	-0.48	1.50	68.7	1.46	0.02	
802.11a	6	5300	60	Left, 0mm	20	18.7	0.54	-0.01	1.35	68.7	1.46	1.05	
802.11a	6	5320	64	Left, 0mm	20	18.6	0.52	-0.7	1.62	68.7	1.46	1.22	7

*Larger than 5% drifts included to scaling factors
**Due to low e-field generated by DUT at the location of drift measurement, the measurements are not applicable.

Mode	Data Rate [Mbps]	Frequency [MHz]	Channel	Test position	Maximum Power [dBm]	Conducted Power [dBm]	Measured SAR_{10g} [W/kg]	Power Drift* [dB]	Scaling Factor	Used Duty Cycle [%]	Duty Cycle Scaling Factor	Reported SAR_{10g} [W/kg]	Plot #
802.11a	6	5500	100	Front, 0mm	20	18.42	0.03	-0.67	1.68	68.7	1.46	0.07	
802.11a	6	5500	100	Back. 0mm	20	18.42	0.23	-0.23	1.52	68.7	1.46	0.50	
802.11a	6	5500	100	Top, 0mm	20	18.42	0.04	N/A**	1.44	68.7	1.46	0.07	
802.11a	6	5500	100	Bottom, 0mm	20	18.42	0.18	0.44	1.59	68.7	1.46	0.41	
802.11a	6	5500	100	Left, 0mm	20	18.42	0.40	-0.62	1.66	68.7	1.46	0.97	8
802.11a	6	5500	100	Right, 0mm	20	18.42	0.0067	0	1.44	68.7	1.46	0.01	
802.11a	6	5560	112	Left, 0mm	20	18.08	0.37	-0.27	1.66	68.7	1.46	0.89	
802.11a	6	5640	128	Left, 0mm	20	17.61	0.31	-0.1	1.73	68.7	1.46	0.77	

*Larger than 5% drifts included to scaling factors
**Due to low e-field generated by DUT at the location of drift measurement, the measurements are not applicable.

Mode	Data Rate [Mbps]	Frequency [MHz]	Channel	Test position	Maximum Power [dBm]	Conducted Power [dBm]	Measured SAR_{10g} [W/kg]	Power Drift* [dB]	Scaling Factor	Used Duty Cycle [%]	Duty Cycle Scaling Factor	Reported SAR_{10g} [W/kg]	Plot #
802.11a	6	5825	165	Front, 0mm	20	18.06	0.03	-0.09	1.56	68.7	1.46	0.06	
802.11a	6	5825	165	Back. 0mm	20	18.06	0.14	0.2	1.56	68.7	1.46	0.33	
802.11a	6	5825	165	Top, 0mm	20	18.06	0.0053	N/A**	2.38	68.7	1.46	0.02	
802.11a	6	5825	165	Bottom, 0mm	20	18.06	0.08	-0.2	1.56	68.7	1.46	0.18	
802.11a	6	5825	165	Left, 0mm	20	18.06	0.33	-0.09	1.56	68.7	1.46	0.75	
802.11a	6	5825	165	Right, 0mm	20	18.06	0.0047	0.05	1.56	68.7	1.46	0.01	
802.11a	6	5660	132	Left, 0mm	20	17.61	0.31	-0.34	1.87	68.7	1.46	0.84	9
802.11a	6	5745	149	Left, 0mm	20	18.05	0.32	-0.24	1.66	68.7	1.46	0.77	

*Larger than 5% drifts included to scaling factors
**Due to low e-field generated by DUT at the location of drift measurement, the measurements are not applicable.

7.2 IEC 62209-2 AMD1:2019

According to IEC 62209-2 AMD1:2019, the zoom scan complies if the peak spatial-average SAR is below 0.1 W/kg, or if the following criteria is met:

1. The smallest horizontal distance from the local SAR peaks to all points 3 dB below the SAR peak is larger than the horizontal grid step.

2. Ratio of SAR at the second measured point (M2) to the SAR at the closest measured point (M1) at the x-y location of the measured maximum is at least 30%.

Zoom scan compliance according to IEC 62209-2 AMD1:2019 is automatically verified by DASY5 software and all zoom scans in this test report do pass the criteria. The smallest horizontal distance and Ratio between measurement points M2 and M1 of the highest SAR results is available in Appendix C.

7.3 Calculated NFC SAR

7.3.1 FCC

For simultaneous transmission evaluation the estimated standalone SAR values are calculated according to the following equation below.

$$SAR_{estimated} = 0.4 * Pant/Pth \ [w/kg] \quad \text{(Equation 6)}$$

Estimated NFC 13.56 MHz SAR = 0.4*(1.0/443) = 0.00090 W/kg

7.3.2 ISED

The estimated SAR value for NFC 13.56 MHz is evaluated according to the following equation stated in Notice 2016-DRS001:

(maximum power level including tune-up tolerance for transmitter A / maximum power level of exemption at the same frequency and distance) * 0.4 W/kg

According to RSS-102, issue 5, 2015, the SAR test exclusion power threshold for NFC is 71mW at ≤5mm separation distance.

Estimated NFC SAR = 1/71*0.4 = 0.0056 W/kg

7.4 Simultaneous Transmission Analysis

Simultaneous transmission analysis for the maximum WLAN SAR is in the table below. Direct summation of SAR results was performed.

7.4.1 FCC

Extremity SAR:

Exposure Condition	Extremity SAR_{10g} [W/kg]					
Test Position	**Front**	**Back**	**Left**	**Right**	**Top**	**Bottom**
Maximum 2.4 GHz WLAN SAR	0.07	0.25	0.90	0.05	0.013	0.07
Maximum 5.0 GHz WLAN SAR	0.07	0.67	1.22	0.02	0.07	0.63
Maximum NFC SAR	0.0009					
SAR Summation:	0.141	0.921	2.121	0.071	0.084	0.701

7.4.2 ISED

Extremity SAR:

Exposure Condition	Extremity SAR_{10g} [W/kg]					
Test Position	**Front**	**Back**	**Left**	**Right**	**Top**	**Bottom**
Maximum 2.4 GHz WLAN SAR	0.07	0.25	0.90	0.05	0.013	0.07
Maximum 5.0 GHz WLAN SAR	0.07	0.67	1.22	0.02	0.07	0.63
Maximum NFC SAR	0.0056					
SAR Summation:	0.146	0.926	2.126	0.076	0.089	0.706

APPENDIX A: PHOTOS OF THE DUT

Size of the DUT is: 180 mm x 60 mm x 80 mm

Figure 3. Front side of the DUT, 0mm

Figure 4. Back side of the DUT, 0mm

Figure 5. Left side of the DUT, 0mm

Figure 6. Right side of the DUT, 0mm

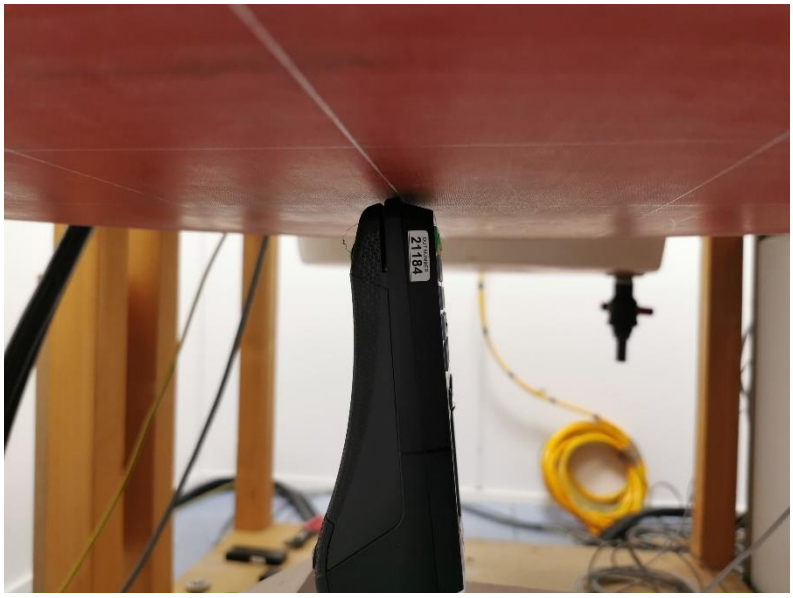


Figure 7. Bottom side of the DUT, 0mm

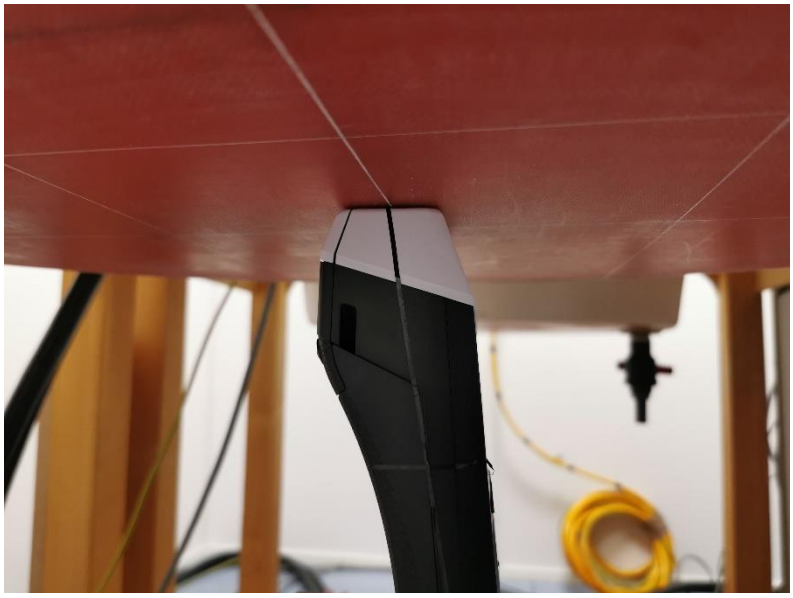


Figure 8. Top side of the DUT, 0mm

APPENDIX B: SYSTEM CHECK SCAN

Plot 1

Date/Time: 9.5.2023 10.59.27

Test Laboratory: Verkotan Oy

DUT: Dipole 2450 MHz D2450V2; Type: D2450V2; Serial: D2450V2 - SN:729

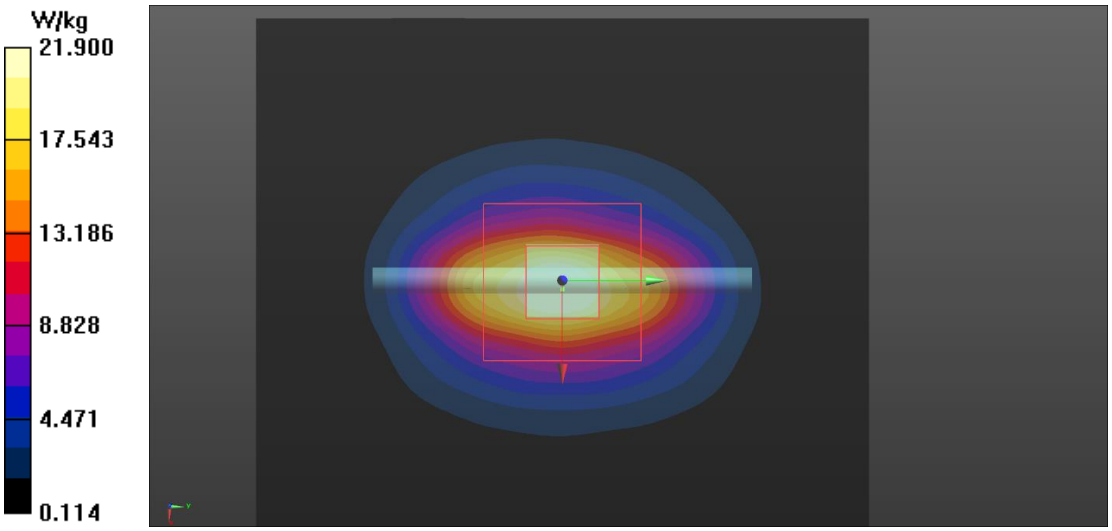
Communication System: UID 0, CW (0); Communication System Band: D2450 (2450.0 MHz); Frequency: 2450 MHz;
Communication System PAR: 0 dB;
Medium parameters used (interpolated): f = 2450 MHz; σ = 1.684 S/m; ε_r = 39.817; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY Configuration:

- Probe: EX3DV4 - SN3892; ConvF(7.09, 7.31, 6.98) @ 2450 MHz; Calibrated: 20.4.2023
  - Sensor-Surface: 1.4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = -4.0, 31.0
  - Electronics: DAE4 Sn705; Calibrated: 14.4.2023
  - Phantom: SAR2_Phantom1_ELI; Type: QD OVA 002 AA;
  - DASY52 52.10.2(1495); SEMCAD X 14.6.14(7483)

Configuration/system check/Area Scan (71x61x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 23.4 W/kg

Configuration/system check/Zoom Scan (9x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 119.5 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 27.2 W/kg
SAR(1 g) = 13.7 W/kg; SAR(10 g) = 6.29 W/kg (SAR corrected for target medium)
Smallest distance from peaks to all points 3 dB below = 7.9 mm
Ratio of SAR at M2 to SAR at M1 = 49.7%
Maximum value of SAR (measured) = 21.9 W/kg



Plot 2

Date/Time: 11.5.2023 9.07.40

Test Laboratory: Verkotan Oy

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1045

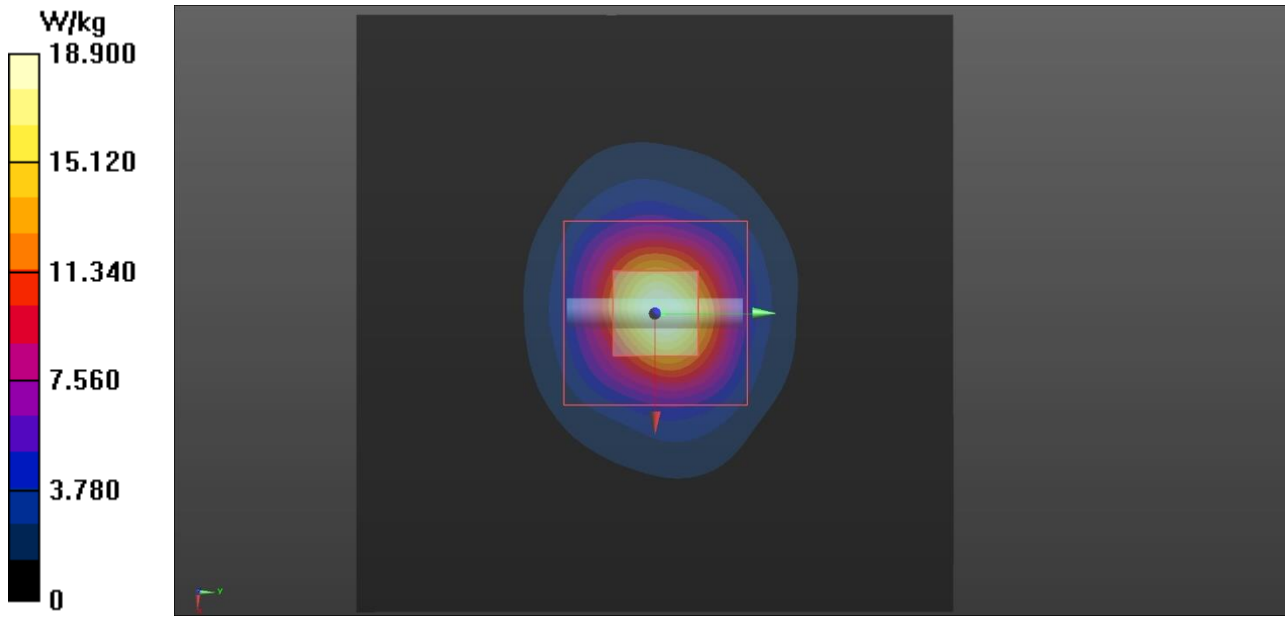
Communication System: UID 0, CW (0); Communication System Band: D5GHz (5000.0 - 6000.0 MHz); Frequency: 5250 MHz;
Communication System PAR: 0 dB;
Medium parameters used (interpolated): f = 5250 MHz; σ = 4.864 S/m; ε_r = 34.325; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY Configuration:

- Probe: EX3DV4 - SN3852; ConvF(4.9, 4.9, 4.9) @ 5250 MHz; Calibrated: 27.10.2022
  - Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = -4.0, 25.0
  - Electronics: DAE4 Sn705; Calibrated: 14.4.2023
  - Phantom: SAR2_Phantom1_ELI; Type: QD OVA 002 AA;
  - DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Configuration/system check 5250MHz/Area Scan (71x71x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 19.7 W/kg

Configuration/system check 5250MHz/Zoom Scan (7x7x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 69.84 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 31.8 W/kg
SAR(1 g) = 7.5 W/kg; SAR(10 g) = 2.16 W/kg (SAR corrected for target medium)
Smallest distance from peaks to all points 3 dB below = 4.8 mm
Ratio of SAR at M2 to SAR at M1 = 64%
Maximum value of SAR (measured) = 18.9 W/kg



Plot 3

Date/Time: 11.5.2023 9.40.08

Test Laboratory: Verkotan Oy

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1045

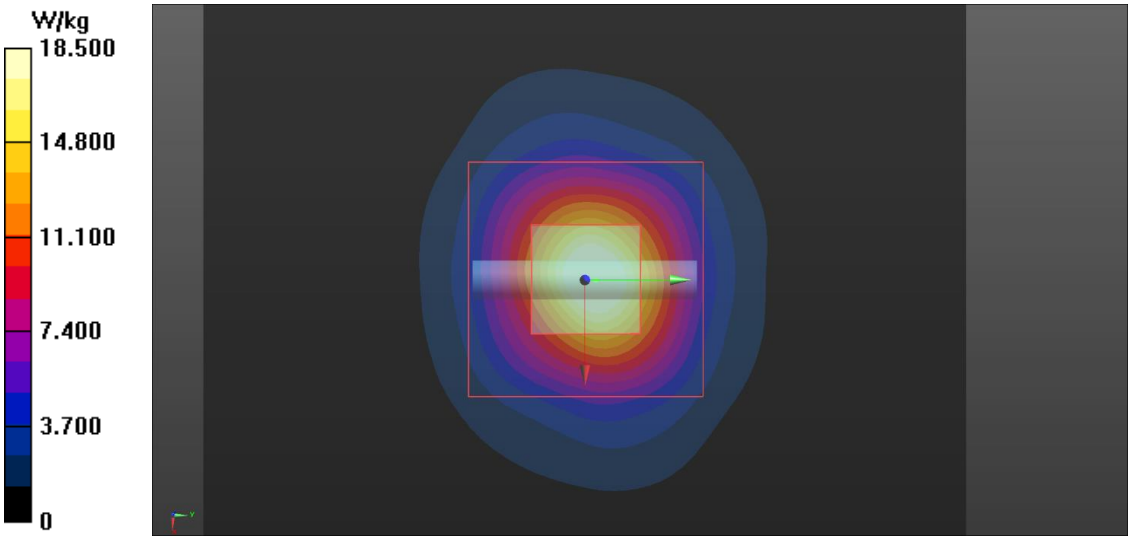
Communication System: UID 0, CW (0); Communication System Band: D5GHz (5000.0 - 6000.0 MHz); Frequency: 5600 MHz;
Communication System PAR: 0 dB;
Medium parameters used: f = 5600 MHz; σ = 5.153 S/m; ε_r = 33.836; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY Configuration:

- Probe: EX3DV4 - SN3852; ConvF(4.61, 4.61, 4.61) @ 5600 MHz; Calibrated: 27.10.2022
  - Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = -4.0, 25.0
  - Electronics: DAE4 Sn705; Calibrated: 14.4.2023
  - Phantom: SAR2_Phantom1_ELI; Type: QD OVA 002 AA;
  - DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Configuration/system check 5600MHz/Area Scan (71x71x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 20.1 W/kg

Configuration/system check 5600MHz/Zoom Scan (7x7x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 66.61 V/m; Power Drift = -0.09 dB
Peak SAR (extrapolated) = 32.6 W/kg
SAR(1 g) = 7.23 W/kg; SAR(10 g) = 2.06 W/kg (SAR corrected for target medium)
Smallest distance from peaks to all points 3 dB below = 5.1 mm
Ratio of SAR at M2 to SAR at M1 = 61.8%
Maximum value of SAR (measured) = 18.5 W/kg



Plot 4

Date/Time: 15.5.2023 9.04.12

Test Laboratory: Verkotan Oy

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1045

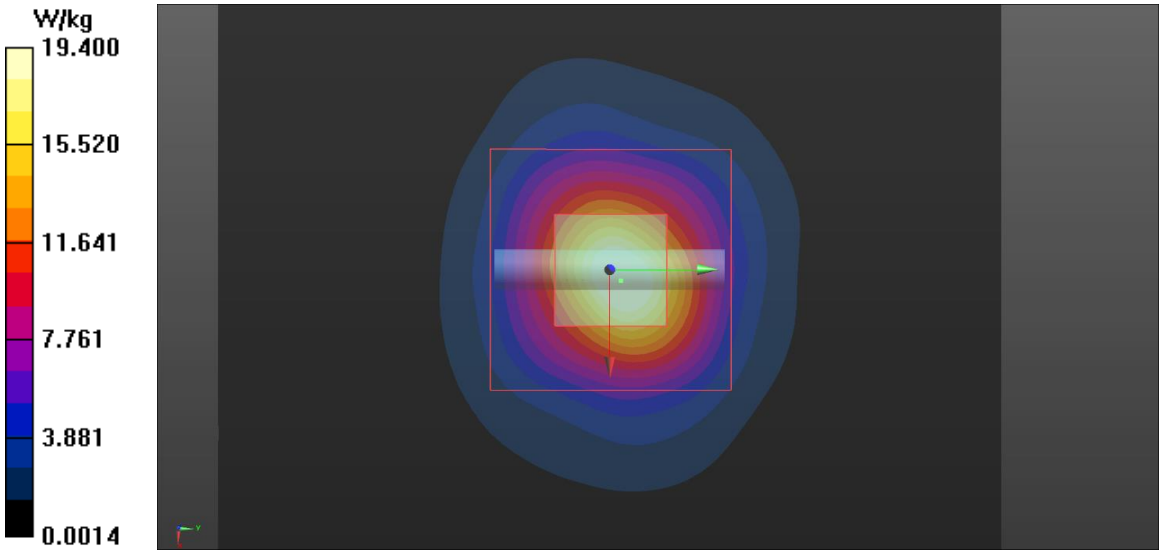
Communication System: UID 0, CW (0); Communication System Band: D5GHz (5000.0 - 6000.0 MHz); Frequency: 5600 MHz;
Communication System PAR: 0 dB;
Medium parameters used: f = 5600 MHz; σ = 5.126 S/m; ε_r = 34.368; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY Configuration:

- Probe: EX3DV4 - SN3852; ConvF(4.61, 4.61, 4.61) @ 5600 MHz; Calibrated: 27.10.2022
  - Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = -4.0, 25.0
  - Electronics: DAE4 Sn705; Calibrated: 14.4.2023
  - Phantom: SAR2_Phantom1_ELI; Type: QD OVA 002 AA;
  - DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Configuration/system check 5600MHz/Area Scan (71x71x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 20.6 W/kg

Configuration/system check 5600MHz/Zoom Scan (7x7x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 71.25 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 33.5 W/kg
SAR(1 g) = 7.71 W/kg; SAR(10 g) = 2.21 W/kg (SAR corrected for target medium)
Smallest distance from peaks to all points 3 dB below = 6.4 mm
Ratio of SAR at M2 to SAR at M1 = 61.4%
Maximum value of SAR (measured) = 19.4 W/kg



Plot 5

Date/Time: 15.5.2023 9.26.52

Test Laboratory: The name of your organization

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1045

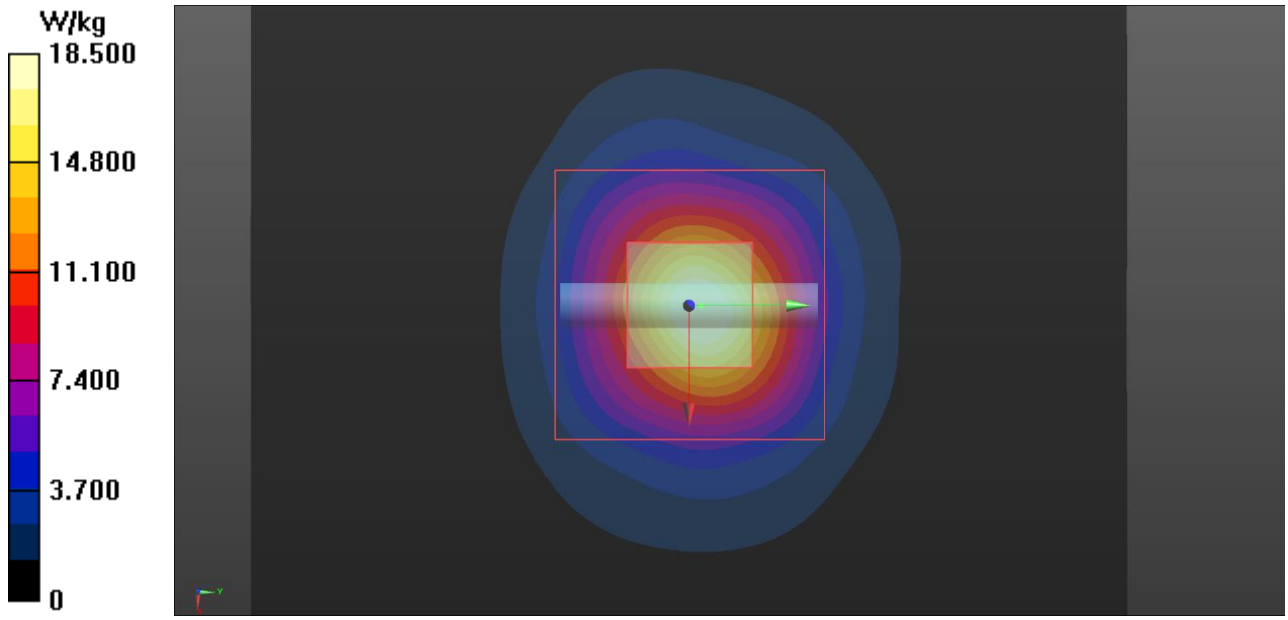
Communication System: UID 0, CW (0); Communication System Band: D5GHz (5000.0 - 6000.0 MHz); Frequency: 5750 MHz;
Communication System PAR: 0 dB;
Medium parameters used: f = 5750 MHz; σ = 5.262 S/m; ε_r = 34.191; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY Configuration:

- Probe: EX3DV4 - SN3852; ConvF(4.65, 4.65, 4.65) @ 5750 MHz; Calibrated: 27.10.2022
  - Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = -4.0, 25.0
  - Electronics: DAE4 Sn705; Calibrated: 14.4.2023
  - Phantom: SAR2_Phantom1_ELI; Type: QD OVA 002 AA;
  - DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Configuration/system check 5750MHz/Area Scan (71x71x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 19.2 W/kg

Configuration/system check 5750MHz/Zoom Scan (7x7x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 66.68 V/m; Power Drift = -0.12 dB
Peak SAR (extrapolated) = 34.4 W/kg
SAR(1 g) = 7.2 W/kg; SAR(10 g) = 2.05 W/kg (SAR corrected for target medium)
Smallest distance from peaks to all points 3 dB below = 5.4 mm
Ratio of SAR at M2 to SAR at M1 = 60.7%
Maximum value of SAR (measured) = 18.5 W/kg



APPENDIX C: MEASUREMENT SCANS

Plot 6

Date/Time: 10/05/2023 14:42:09

Test Laboratory: Verkotan Oy

DUT: Desk/2600 CL/WiFi;

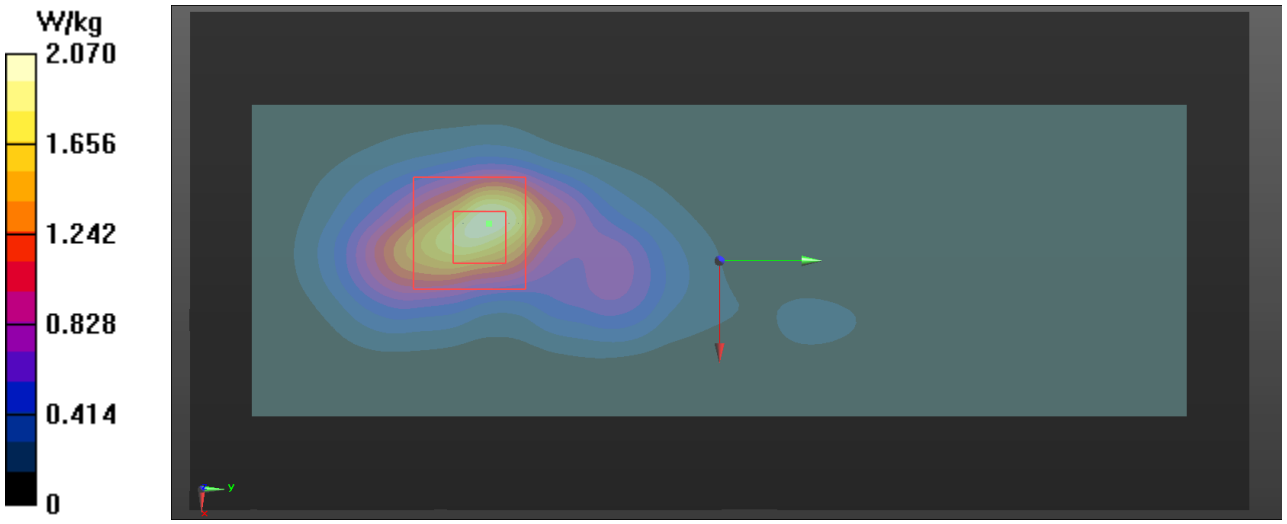
Communication System: UID 0, WLAN 2.4 (0); Communication System Band: WLAN2.4GHz; Frequency: 2462 MHz;
Communication System PAR: 0 dB;
Medium parameters used: f = 2462 MHz; σ = 1.691 S/m; ε_r = 39.794; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY Configuration:

- Probe: EX3DV4 - SN3892; ConvF(7.09, 7.31, 6.98) @ 2462 MHz; Calibrated: 20/04/2023
  - Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 31.0, -4.0
  - Electronics: DAE4 Sn705; Calibrated: 14/04/2023
  - Phantom: SAR2_Phantom1_ELI; Type: QD OVA 002 AA;
  - DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Configuration/WLAN 2.4GHz, CH11, Data Rate 1Mbps, Left 0mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 9.473 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 2.59 W/kg
SAR(1 g) = 1.25 W/kg; SAR(10 g) = 0.576 W/kg (SAR corrected for target medium)
Smallest distance from peaks to all points 3 dB below = 8.6 mm
Ratio of SAR at M2 to SAR at M1 = 48.2%
Maximum value of SAR (measured) = 1.98 W/kg

Configuration/WLAN 2.4GHz, CH11, Data Rate 1Mbps, Left 0mm/Area Scan (171x81x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 2.07 W/kg



Plot 7

Date/Time: 12/05/2023 11:41:03

Test Laboratory: Verkotan Oy

DUT: Desk/2600 CL/WiFi;

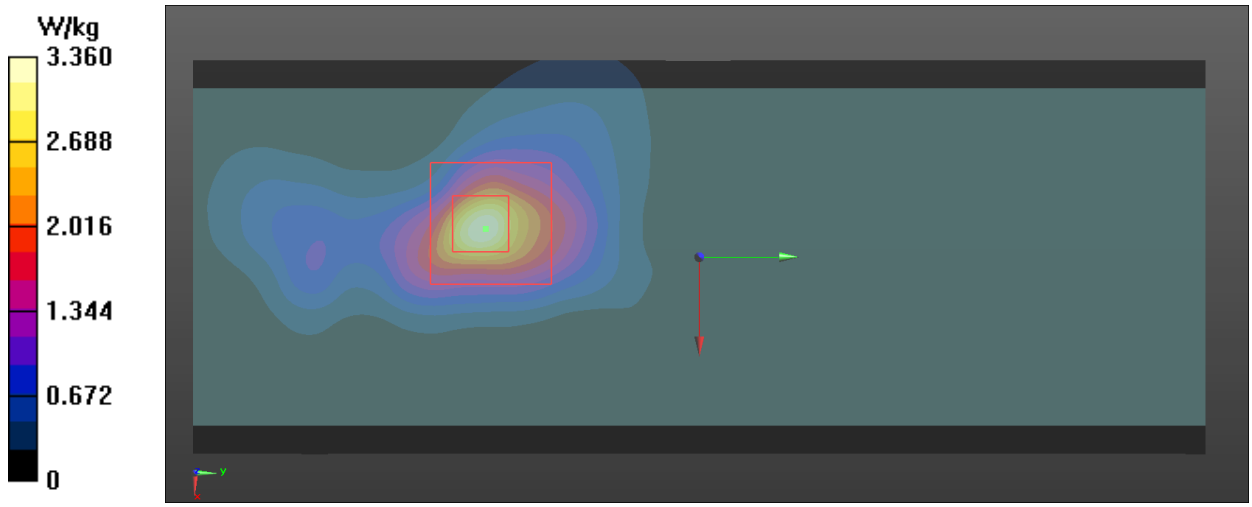
Communication System: UID 0, WLAN5GHz (0); Communication System Band: 5GHz; Frequency: 5320 MHz;
Communication System PAR: 0 dB;
Medium parameters used: f = 5320 MHz; σ = 4.92 S/m; ε_r = 34.225; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY Configuration:

- Probe: EX3DV4 - SN3852; ConvF(4.9, 4.9, 4.9) @ 5320 MHz; Calibrated: 27/10/2022
  - Sensor-Surface: 1.4mm (Mechanical Surface Detection), Sensor-Surface: 1.4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), z = 25.0, -4.0
  - Electronics: DAE4 Sn705; Calibrated: 14/04/2023
  - Phantom: SAR2_Phantom1_ELI; Type: QD OVA 002 AA;
  - DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Configuration/WLAN 5GHz, CH64, Data Rate 6Mbps, Left 0mm/Zoom Scan (9x9x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 2.609 V/m; Power Drift = -0.70 dB
Peak SAR (extrapolated) = 6.47 W/kg
SAR(1 g) = 1.62 W/kg; SAR(10 g) = 0.518 W/kg (SAR corrected for target medium)
Smallest distance from peaks to all points 3 dB below = 5.7 mm
Ratio of SAR at M2 to SAR at M1 = 68%
Maximum value of SAR (measured) = 3.86 W/kg

Configuration/WLAN 5GHz, CH64, Data Rate 6Mbps, Left 0mm/Area Scan (181x71x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 3.36 W/kg



Plot 8

Date/Time: 15/05/2023 11:05:48

Test Laboratory: Verkotan Oy

DUT: Desk/2600 CL/WiFi;

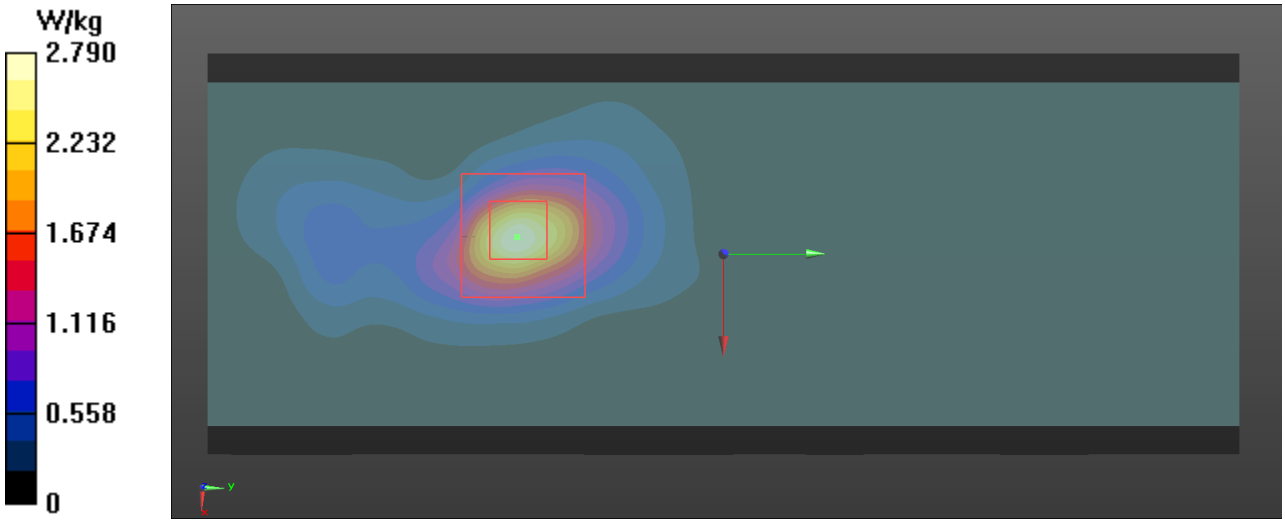
Communication System: UID 0, WLAN5GHz (0); Communication System Band: 5GHz; Frequency: 5500 MHz;
Communication System PAR: 0 dB;
Medium parameters used: f = 5500 MHz; σ = 5.034 S/m; ε_r = 34.495; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY Configuration:

- Probe: EX3DV4 - SN3852; ConvF(4.61, 4.61, 4.61) @ 5500 MHz; Calibrated: 27/10/2022
  - Sensor-Surface: 1.4mm (Mechanical Surface Detection), Sensor-Surface: 1.4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), z = 25.0, -4.0
  - Electronics: DAE4 Sn705; Calibrated: 14/04/2023
  - Phantom: SAR2_Phantom1_ELI; Type: QD OVA 002 AA;
  - DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Configuration/WLAN 5GHz, CH100, Data Rate 6Mbps, Left 0mm/Zoom Scan (8x8x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 3.194 V/m; Power Drift = -0.62 dB
Peak SAR (extrapolated) = 5.09 W/kg
SAR(1 g) = 1.29 W/kg; SAR(10 g) = 0.403 W/kg (SAR corrected for target medium)
Smallest distance from peaks to all points 3 dB below = 7.2 mm
Ratio of SAR at M2 to SAR at M1 = 62.8%
Maximum value of SAR (measured) = 3.10 W/kg

Configuration/WLAN 5GHz, CH100, Data Rate 6Mbps, Left 0mm/Area Scan (181x71x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 2.79 W/kg



Plot 9

Date/Time: 15/05/2023 14:23:55

Test Laboratory: Verkotan Oy

DUT: Desk/2600 CL/WiFi;

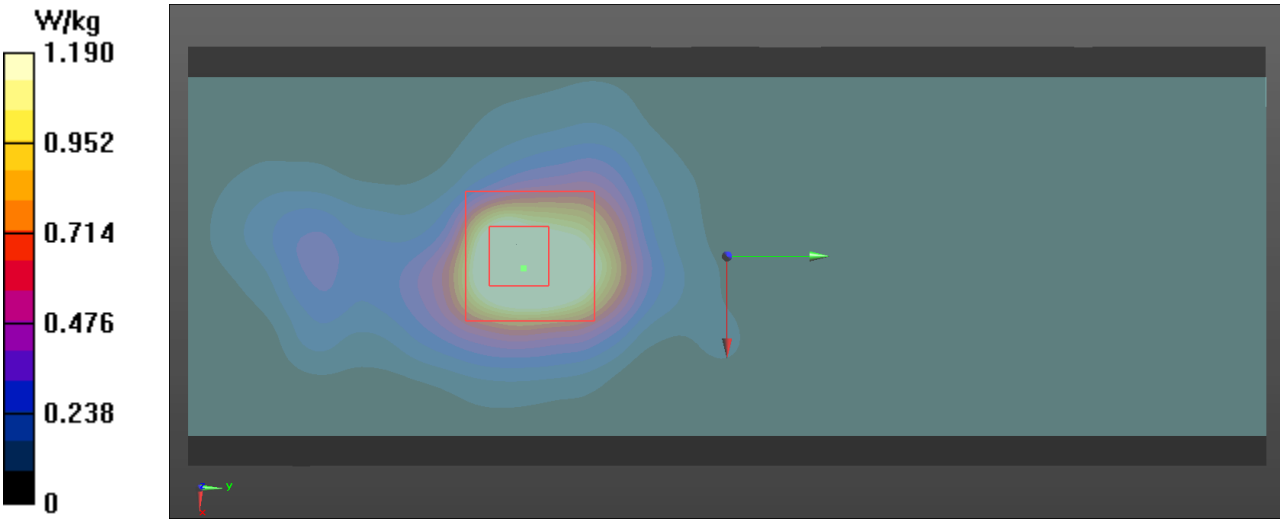
Communication System: UID 0, WLAN5GHz (0); Communication System Band: 5GHz; Frequency: 5660 MHz;
Communication System PAR: 0 dB;
Medium parameters used: f = 5660 MHz; σ = 5.183 S/m; ε_r = 34.306; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY Configuration:

- Probe: EX3DV4 - SN3852; ConvF(4.61, 4.61, 4.61) @ 5660 MHz; Calibrated: 27/10/2022
  - Sensor-Surface: 1.4mm (Mechanical Surface Detection), Sensor-Surface: 1.4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), z = 25.0, -4.0
  - Electronics: DAE4 Sn705; Calibrated: 14/04/2023
  - Phantom: SAR2_Phantom1_ELI; Type: QD OVA 002 AA;
  - DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Configuration/WLAN 5GHz, CH132, Data Rate 6Mbps, Left 0mm/Zoom Scan (8x8x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 20.36 V/m; Power Drift = -0.34 dB
Peak SAR (extrapolated) = 3.60 W/kg
SAR(1 g) = 0.961 W/kg; SAR(10 g) = 0.307 W/kg (SAR corrected for target medium)
Smallest distance from peaks to all points 3 dB below = 7.2 mm
Ratio of SAR at M2 to SAR at M1 = 64.3%
Maximum value of SAR (measured) = 2.22 W/kg

Configuration/WLAN 5GHz, CH132, Data Rate 6Mbps, Left 0mm/Area Scan (181x71x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 1.81 W/kg



APPENDIX D: RELEVANT PAGES FROM PROBE CALIBRATION REPORTS

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

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S 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

Accreditation No.: SCS 0108

Client: Verkotan — Certificate No: EX-3852_Oct22

CALIBRATION CERTIFICATE

Object	EX3DV4 - SN:3852
Calibration procedure(s)	QA CAL-01.v9, QA CAL-12.v9, QA CAL-14.v6, QA CAL-23.v5, QA CAL-25.v7 Calibration procedure for dosimetric E-field probes
Calibration date	October 27, 2022

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-22 (No. 217-03525/03524)	Apr-23
Power sensor NRP-Z91	SN: 103244	04-Apr-22 (No. 217-03524)	Apr-23
OCP DAK-3.5 (weighted)	SN: 1249	20-Oct-22 (OCP-DAK3.5-1249_Oct22)	Oct-23
OCP DAK-12	SN: 1016	20-Oct-22 (OCP-DAK12-1016_Oct22)	Oct-23
Reference 20 dB Attenuator	SN: CC2552 (20x)	04-Apr-22 (No. 217-03527)	Apr-23
DAE4	SN: 660	10-Oct-22 (No. DAE4-660_Oct22)	Oct-23
Reference Probe ES3DV2	SN: 3013	27-Dec-21 (No. ES3-3013_Dec21)	Dec-22

Secondary Standards	ID	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB41293874	06-Apr-16 (in house check Jun-22)	In house check: Jun-24
Power sensor E4412A	SN: MY41498087	06-Apr-16 (in house check Jun-22)	In house check: Jun-24
Power sensor E4412A	SN: 000110210	06-Apr-16 (in house check Jun-22)	In house check: Jun-24
RF generator HP 8648C	SN: US3642U01700	04-Aug-99 (in house check Jun-22)	In house check: Jun-24
Network Analyzer E8358A	SN: US41080477	31-Mar-14 (in house check Oct-22)	In house check: Oct-24

	Name	Function	Signature
Calibrated by	Michael Weber	Laboratory Technician	
Approved by	Sven Kühn	Technical Manager	

Issued: October 27, 2022

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

Certificate No: EX-3852_Oct22 Page 1 of 9

Parameters of Probe: EX3DV4 - SN:3852

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc ($k = 2$)
Norm ($\mu V/(V/m)^2$) [A]	0.41	0.39	0.46	±10.1%
DCP (mV) [B]	99.8	98.2	99.9	±4.7%

Calibration Results for Modulation Response

UID	Communication System Name		A dB	B $dB\sqrt{\mu V}$	C	D dB	VR mV	Max dev.	Max Unc[E] $k = 2$
0	CW	X	0.00	0.00	1.00	0.00	147.5	±2.5%	±4.7%
		Y	0.00	0.00	1.00		138.0		
		Z	0.00	0.00	1.00		137.1		

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%.

[A] The uncertainties of Norm X,Y,Z do not affect the E^2-field uncertainty inside TSL (see Page 5).
[B] Linearization parameter uncertainty for maximum specified field strength.
[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

Parameters of Probe: EX3DV4 - SN:3852

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle	126.7°
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	1.4 mm

Note: Measurement distance from surface can be increased to 3–4 mm for an *Area Scan* job.

Parameters of Probe: EX3DV4 - SN:3852

Calibration Parameter Determined in Head Tissue Simulating Media

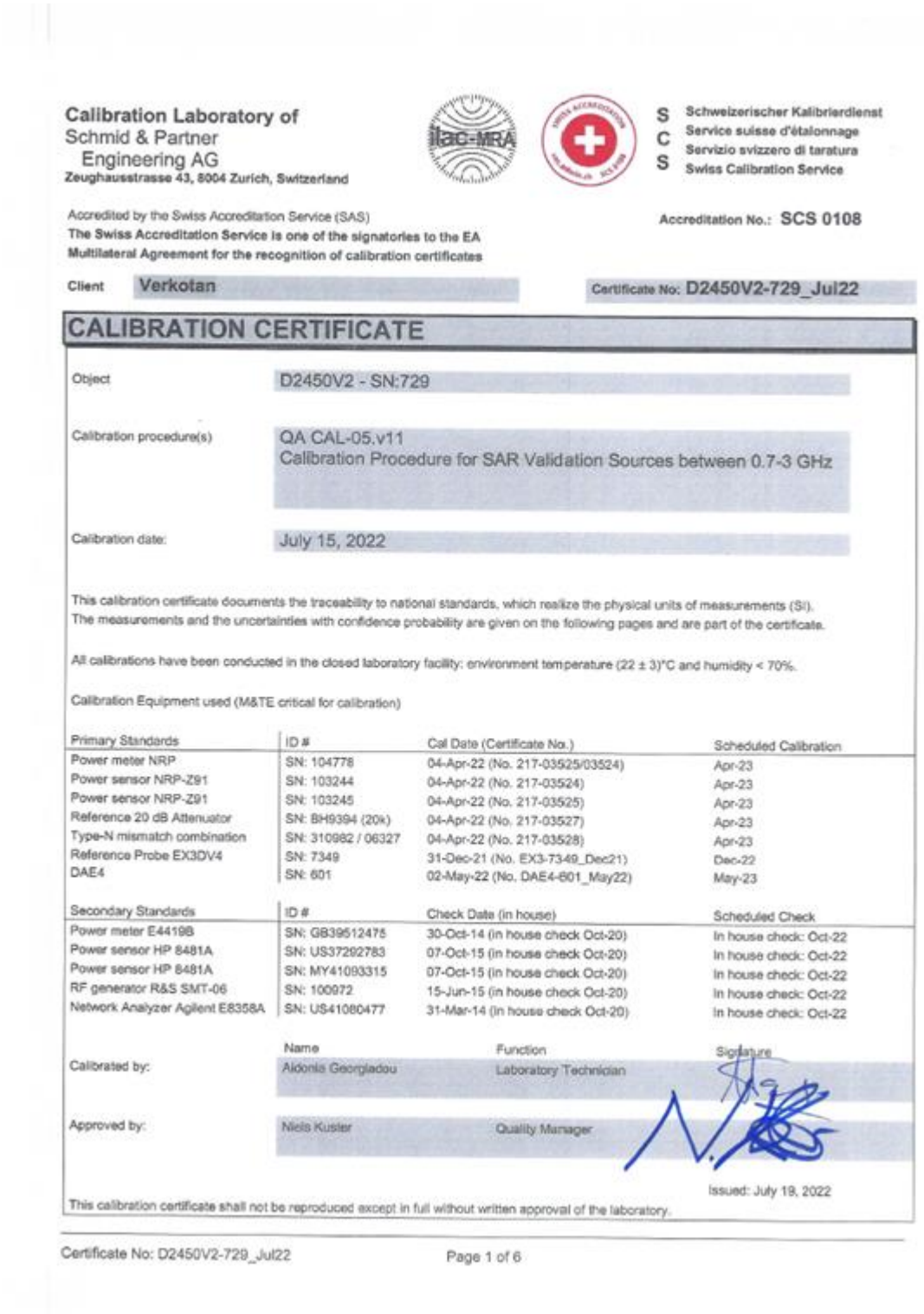
f (MHz)[C]	Relative Permittivity[F]	Conductivity[F] (S/m)	ConvF X	ConvF Y	ConvF Z	Alpha[G]	Depth[G] (mm)	Unc ($k = 2$)
6	55.0	0.75	15.18	15.18	15.18	0.00	1.00	±13.3%
30	55.0	0.75	13.34	13.34	13.34	0.00	1.00	±13.3%
64	54.2	0.75	11.88	11.88	11.88	0.00	1.00	±13.3%
128	52.8	0.76	11.57	11.57	11.57	0.00	1.00	±13.3%
220	49.0	0.81	10.92	10.92	10.92	0.00	1.00	±13.3%
450	43.5	0.87	10.20	10.20	10.20	0.16	1.30	±13.3%
900	41.5	0.97	8.82	8.82	8.82	0.44	0.94	±12.0%
1300	40.8	1.14	8.54	8.54	8.54	0.27	1.22	±12.0%
1450	40.5	1.20	8.63	8.63	8.63	0.39	0.80	±12.0%
1640	40.2	1.31	8.33	8.33	8.33	0.34	0.90	±12.0%
1810	40.0	1.40	7.90	7.90	7.90	0.38	0.90	±12.0%
1900	40.0	1.40	7.72	7.72	7.72	0.36	0.90	±12.0%
2450	39.2	1.80	7.48	7.48	7.48	0.41	0.90	±12.0%
3300	38.2	2.71	6.85	6.85	6.85	0.30	1.30	±13.1%
3500	37.9	2.91	6.83	6.83	6.83	0.30	1.35	±13.1%
3700	37.7	3.12	6.65	6.65	6.65	0.30	1.35	±13.1%
3900	37.5	3.32	6.38	6.38	6.38	0.40	1.60	±13.1%
4100	37.2	3.53	6.19	6.19	6.19	0.40	1.60	±13.1%
5250	35.9	4.71	4.90	4.90	4.90	0.40	1.80	±13.1%
5600	35.5	5.07	4.61	4.61	4.61	0.40	1.80	±13.1%
5750	35.4	5.22	4.65	4.65	4.65	0.40	1.80	±13.1%

[C] Frequency validity above 300 MHz of ±100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ±50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ±10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Validity of ConvF assessed at 6 MHz is 4–9 MHz, and ConvF assessed at 13 MHz is 9–19 MHz. Above 5 GHz frequency validity can be extended to ±110 MHz.

[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ±10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ±5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ±1% for frequencies below 3 GHz and below ±2% for frequencies between 3–6 GHz at any distance larger than half the probe tip diameter from the boundary.

APPENDIX E: RELEVANT PAGES FROM DIPOLE CALIBRATION REPORTS



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

S C S 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

Accreditation No.: SCS 0108

Client Verkotan

Certificate No: D2450V2-729_Jul22

CALIBRATION CERTIFICATE

Object	D2450V2 - SN:729
Calibration procedure(s)	QA CAL-05.v11 Calibration Procedure for SAR Validation Sources between 0.7-3 GHz
Calibration date:	July 15, 2022

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-22 (No. 217-03525/03524)	Apr-23
Power sensor NRP-Z91	SN: 103244	04-Apr-22 (No. 217-03524)	Apr-23
Power sensor NRP-Z91	SN: 103245	04-Apr-22 (No. 217-03525)	Apr-23
Reference 20 dB Attenuator	SN: BH9394 (20k)	04-Apr-22 (No. 217-03527)	Apr-23
Type-N mismatch combination	SN: 310982 / 06327	04-Apr-22 (No. 217-03528)	Apr-23
Reference Probe EX3DV4	SN: 7349	31-Dec-21 (No. EX3-7349_Dec21)	Dec-22
DAE4	SN: 601	02-May-22 (No. DAE4-601_May22)	May-23

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: MY41093315	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-22

	Name	Function	Signature
Calibrated by:	Aldonia Georgiadou	Laboratory Technician	
Approved by:	Niels Kuster	Quality Manager	

Issued: July 19, 2022

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

Certificate No: D2450V2-729_Jul22 Page 1 of 6

Measurement Conditions

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

DASY Version	DASY52	V52.10.4
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	37.9 ± 6 %	1.85 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	---	---

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.4 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**52.3 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.21 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**24.5 W/kg ± 16.5 % (k=2)**

SAR Reference Dipole Calibration Report

Ref : ACR.68.8.23.BES.A

VERKOTAN OY
ELEKTRONIIKKATIE 17
90590, OULU, FINLAND
SAR REFERENCE DIPOLE
FREQUENCY: 5200-5800 MHZ
SERIAL NO.: 1045

Calibrated at MVG
Z.I. de la pointe du diable
Technopôle Brest Iroise – 295 avenue Alexis de Rochon
29280 PLOUZANE - FRANCE

Calibration date: 03/09/2023

Accreditations #2-6789 and #2-6814
Scope available on www.cofrac.fr

Summary:

This document presents the method and results from an accredited SAR reference dipole calibration performed in MVG using the COMOSAR test bench. All calibration results are traceable to national metrology institutions.

Page: 1/9

mvg

SAR REFERENCE DIPOLE CALIBRATION REPORT Ref: ACR.60.8.23.BES.A

	Name	Function	Date	Signature
Prepared by :	Cyrille ONNEE	Measurement Responsible	3/9/2023	
Checked & approved by:	Jérôme Luc	Technical Manager	3/9/2023	
Authorized by:	Yann Toutain	Laboratory Director	3/9/2023	

Yann Toutain ID Signature numérique de Yann Toutain ID Date : 2023.09.09 15:05:03 +01'00'

	Customer Name
Distribution :	Verkotan Oy

Issue	Name	Date	Modifications
A	Cyrille ONNEE	3/9/2023	Initial release

Page: 2/9

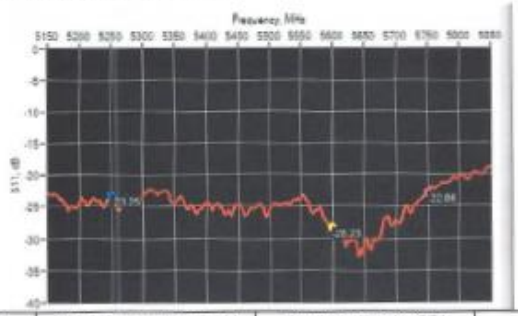
6 CALIBRATION RESULTS

6.1 MECHANICAL DIMENSIONS

L mm		h mm		d mm	
Measured	Required	Measured	Required	Measured	Required
-	20.60 +/- 2%	-	40.30 +/- 2%	-	3.60 +/- 2%

6.2 S11 PARAMETER

6.2.1 S11 parameter in Head Liquid



Frequency (MHz)	S11 parameter (dB)	Requirement (dB)	Impedance
5250	-23.25	-20	47.8Ω + 6.4jΩ
5600	-28.23	-20	48.5Ω - 3.5jΩ
5750	-22.86	-20	46.7Ω + 6.1jΩ

6.3 SAR

The IEC/IEEE 62209-1528 and FCC KDB865664 D01 standards state that the system validation measurements must be performed using a reference dipole meeting the fore mentioned return loss and mechanical dimension requirements. The validation measurement must be performed against a liquid filled flat phantom, with the phantom constructed as outlined in the fore mentioned standards. Per the standards, the dipole shall be positioned below the bottom of the phantom, with the dipole length centered and parallel to the longest dimension of the flat phantom, with the top surface of the dipole at the described distance from the bottom surface of the phantom.

6.3.1 SAR with Head Liquid

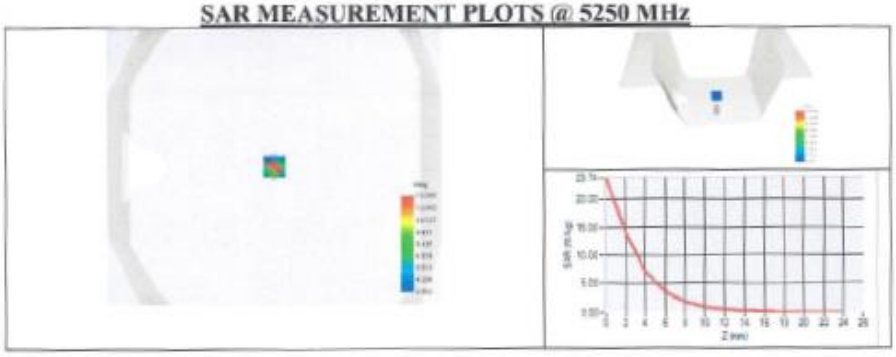
The IEC/IEEE 62209-1528 and FCC KDB865664 D01 standards state that the system validation measurements should produce the SAR values shown below (for phantom thickness of 2 mm), within the uncertainty for the system validation. All SAR values are normalized to 1 W forward power. In bracket, the measured SAR is given with the used input power.

SAR REFERENCE DIPOLE CALIBRATION REPORT Ref: ACR.68.8.23.BES.A

Software	OPENSAR V5
Phantom	SN 13/09 SAM68
Probe	SN 41/18 EPGO333
Liquid	Head Liquid Values @ 5250 MHz: eps' : 34.3 sigma : 4.67 Head Liquid Values @ 5600 MHz: eps' : 33.6 sigma : 5.05 Head Liquid Values @ 5750 MHz: eps' : 32.9 sigma : 5.46
Distance between dipole center and liquid	10.0 mm
Area scan resolution	dx=8mm/dy=8mm
Zoon Scan Resolution	dx=4mm/dy=4mm/dz=2mm
Frequency	5250 MHz 5600 MHz 5750 MHz
Input power	20 dBm
Liquid Temperature	20 +/- 1 °C
Lab Temperature	20 +/- 1 °C
Lab Humidity	30-70 %

Frequency	1g SAR (W/kg)			10g SAR (W/kg)		
	Measured	Measured normalized to 1W	Target normalized to 1W	Measured	Measured normalized to 1W	Target normalized to 1W
5250 MHz	7.31	73.09	-	2.11	21.12	-
5600 MHz	7.29	72.92	78.30	2.13	21.29	23.20
5750 MHz	6.91	69.05	-	2.03	20.27	-

SAR MEASUREMENT PLOTS @ 5250 MHz



Page: 7/9

